Graw-Hill Publishing Company, Inc.

December 25, 1930

$5 per year
25 cents

Engineering
Library

DEC 26 1930

Engineering News-Record

Laying Articulated Concrete Revetment along the Mississippi River

Articulated Concrete Revetment Construction

Winter Concreting on a Bridge at Lansing, Michigan

Operating Charts Aid in Reservoir Control

Hinged Steel Weir Gates on Harper Dam in Oregon

Hoover Dam Contracts—Data and Drawings

KREOLITE

"Outlast the Factory"

Withstand heavy weight and vibration

Nowhere in industry are more perplexing floor problems to be found than in shops where the giant machines pound and vibrate unendingly day in and day out.

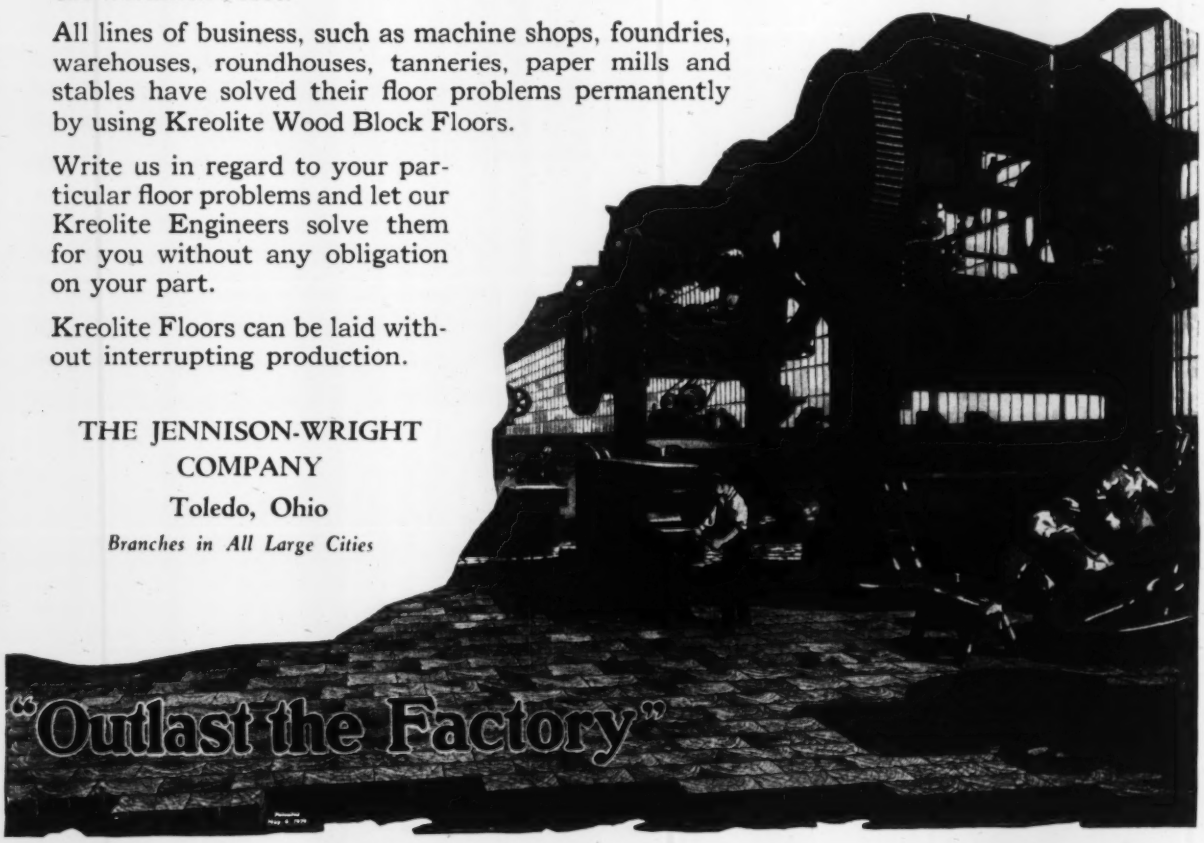
Kreolite Wood Blocks are cut from carefully selected seasoned timber and are laid with the tough end-grain uppermost. Their grooved construction permits Kreolite Filler to penetrate the full depth of the blocks and bind the entire floor into a solidified unit. The surface is smooth, warm, resilient, sanitary and easy on the workmen's feet.

All lines of business, such as machine shops, foundries, warehouses, roundhouses, tanneries, paper mills and stables have solved their floor problems permanently by using Kreolite Wood Block Floors.

Write us in regard to your particular floor problems and let our Kreolite Engineers solve them for you without any obligation on your part.

Kreolite Floors can be laid without interrupting production.

THE JENNISON-WRIGHT COMPANY
Toledo, Ohio
Branches in All Large Cities



WOOD BLOCK FLOORS

ENGINEERING NEWS-RECORD

A Consolidation of Engineering News, Engineering Record, The Sanitary Engineer, and The Contractor

F. E. SCHMITT, *Editor*

Editorial Staff
New York
V. T. BOUGHTON
Managing Editor
M. N. BAKER
C. S. HILL
W. G. BOWMAN
H. W. RICHARDSON
R. B. GARRABRANT

Editorial Staff
Chicago
W. W. DU BERRARD
E. E. R. TRATMAN
San Francisco
N. A. BOWERS
J. I. BALLARD

WILLARD CHEVALIER
Publishing Director

Contents for December 25, 1930

VOLUME 105, NUMBER 26

Copyright, 1930, by McGraw-Hill Publishing Company, Inc.

Concrete Revetment Construction on the Mississippi 996
By MORRIS W. GILLAND

The Highways of Italy 1003
By PIETRO LANINO

Winter Concreting on a Three-Arch Bridge 1004
By RICHARD F. REY

Water-Power Operation Charts Aid in Reservoir Control 1006
By MELVIN D. CASLER

Hinged Steel Weir Gates in Diversion Dam 1010

Hoover Dam Plans and Specifications 1011

Editorials 993

Review of Engineering Literature 1018

Letters to the Editor 1022

News of the Week 1023

Construction Equipment and Materials 1029

Unit Prices From Current Construction Bids 1031

An Index

for the second half of the year 1930 will be published with the issue of Jan. 8, 1931

McGRAW-HILL PUBLISHING COMPANY, INC., Tenth Ave. at 36th St., NEW YORK, N. Y.

JAMES H. MCGRAW, Chairman of the Board
MALCOLM MUIR, President
JAMES H. MCGRAW, JR., Vice-Pres. and Treas.
EDWARD J. MEHREN, Vice-President
MASON BRITTON, Vice-President
EDGAR KOBAK, Vice-President
HAROLD W. MCGRAW, Vice-President
H. C. PARMELEE, Editorial Director
C. H. THOMPSON, Secretary

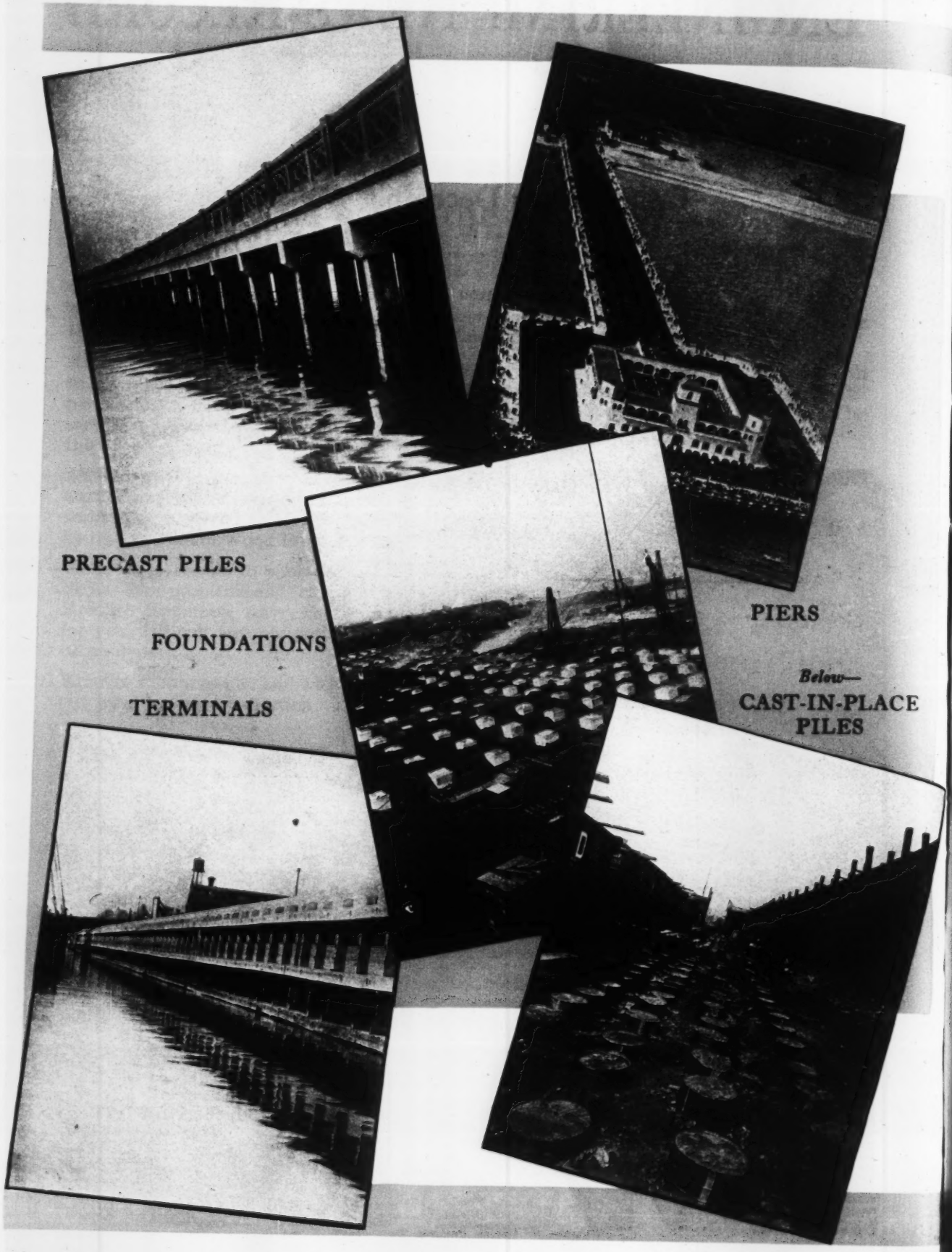
CABLE ADDRESS: "MACHINIST, N. Y."

Published weekly. $5 per year. 25 cents per copy. Entered as second-class matter April 11, 1917, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in U. S. A.

Member A.B.C.
Member A.B.P.

NUMBER OF COPIES PRINTED THIS ISSUE, 31,852

NEW YORK District Office, 285 Madison Avenue
WASHINGTON, National Press Building
CHICAGO, 520 N. Michigan Avenue
PHILADELPHIA, 1600 Arch Street
CLEVELAND, 501 Guardian Building
ST. LOUIS, 1556 Bell Telephone Building
SAN FRANCISCO, 883 Mission Street
BOSTON, 1427 Statler Building
GREENVILLE, S. C., 1301 Woodside Building
DETROIT, 2-257 General Motors Building
LOS ANGELES, 632 Chamber of Commerce Bldg.
LONDON, 6 Bouverie Street, London, E. C. 4


PRECAST PILES
FOUNDATIONS
TERMINALS
PIERS
Below—
CAST-IN-PLACE PILES

background_

To prospective clients, Raymond brings a rich and varied background of experience. This experience has been gained on all types of concrete work, overcoming all sorts of difficult conditions; in many instances in out-of-the-way situations. This background of Raymond experience, then, means that your requirements will be met, your difficulties overcome, your schedules bettered, by an organization whose facilities and personnel are equal to any demands placed upon them at any time, anywhere.

CAST IN PLACE PILES
COMPOSITE PILES
PRECAST PILES
PIPE PILES

"A form for every pile
A pile for every purpose"

BUILDING FOUNDATIONS
BULKHEADS AND DOCKS
UNDERPINNING ETC.
BRIDGES

RAYMOND CONCRETE PILE COMPANY

NEW YORK: 140 Cedar St. CHICAGO: 111 West Monroe St.

Canadian Licensees: Raymond Concrete Pile Co., Ltd., Montreal, Canada

BRANCH OFFICES IN

Atlanta, Ga.	Houston, Texas	Pittsburgh, Pa.	St. Louis, Mo.	Caracas, Ven., S. A.
Baltimore, Md.	Kansas City, Mo.	San Francisco, Cal.	St. Paul, Minn.	Bogota, Colombia, S. A.
Boston, Mass.	Los Angeles, Cal.	Washington, D. C.	Honkkong, China	Buenaventura, Col., S. A.
Chicago, Ill.	Miami, Fla.	Buffalo, N. Y.	London, England	Omori, Tokyo-Fu, Japan
Cleveland, Ohio	Philadelphia, Pa.	Milwaukee, Wis.	Maracaibo, Ven., S. A.	Portland, Ore.
Detroit, Mich.				

RAYMOND

Greetings

from

American Steel & Wire Company

Again the Yuletide, with its inspirations of good cheer is with us—the New Year approaches—and we sincerely extend to you our very best wishes for a very

MERRY CHRISTMAS and a
HAPPY, PROSPEROUS
NINETEEN THIRTY-ONE

You Can Depend Upon
AMERICAN
STEEL & WIRE COMPANY
WIRE ROPE

AMERICAN STEEL & WIRE COMPANY

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

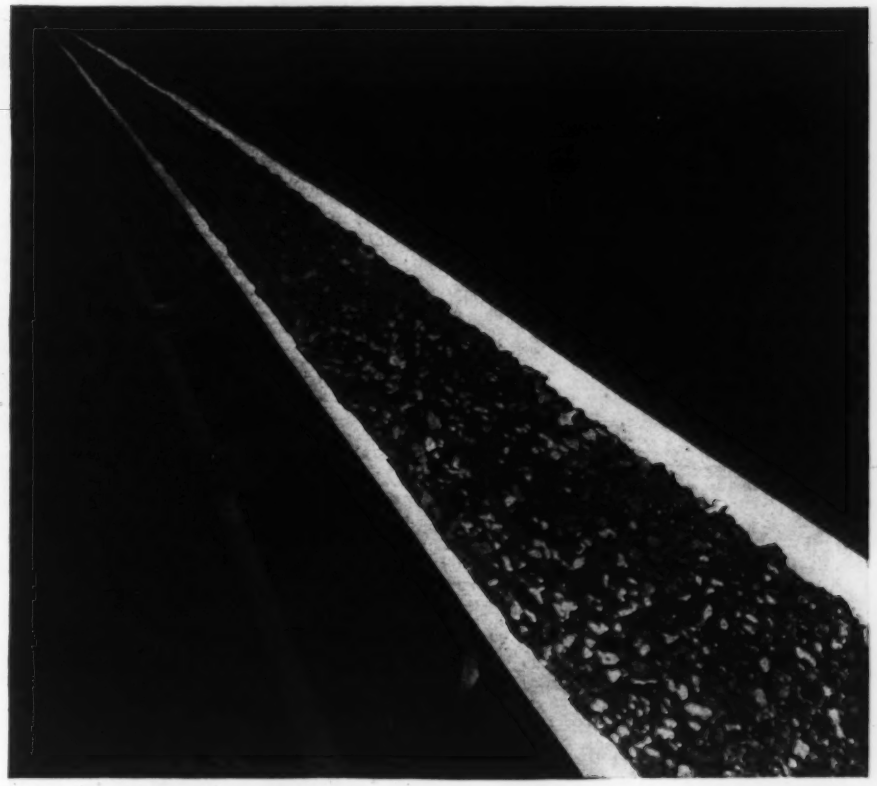
208 S. La Salle Street, Chicago — 30 Church Street, New York

Other Sales Offices: Atlanta Baltimore Birmingham Boston Buffalo Cincinnati Cleveland Dallas Denver Detroit Kansas City Memphis Milwaukee Minneapolis-St. Paul Oklahoma City Philadelphia Pittsburgh Salt Lake City St. Louis Wilkes-Barre Worcester

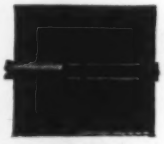
Pacific Coast Distributors; Columbia Steel Company, San Francisco Los Angeles Portland Seattle Honolulu

Export Distributors: United States Steel Products Co., 30 Church St., New York City

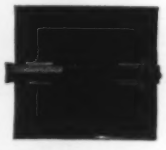
Large Capacity
Little Power Needed
Few Wearing Parts



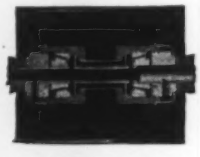
A Belt Pulley for Every Need



Plain Bearing



Bronze-bushed Bearing



Roller Bearing

Over 200 Kinds of Material Are—

being handled on Jeffrey Troughed Belt Conveyors. For handling your bulk materials they will provide continuous delivery — relatively high speed—large capacity for the size of the conveying unit—and a complete separation of material carried from moving parts.

A controlled steady stream of material can be maintained at a speed that will key in with the flow of other products through your plant.

In selecting Jeffrey Belt Conveyors, users have considered something more than first cost. We believe that you, too, will be interested in the following features:

Recessed greased pockets in Jeffrey Pulleys prevent grease buttons from forming in the grease orifice of the hollow shaft, which in ordinary pulleys prevent satisfactory lubrication.

Pulleys are of gray cast iron with a smooth hard surface that resists wear and rust. Only 5/16-in. clearance between pulleys—belt cannot sag and cut on idlers. Open end pulleys prevent dirt from accumulating on bearings.

Jeffrey Pulleys are made with three types of bearings: plain, bronze bushed, and roller, and in sizes to meet practically any requirement.

Write now for Catalog No. 409-C.

The Jeffrey Manufacturing Company
923-99 North Fourth St., Columbus, Ohio

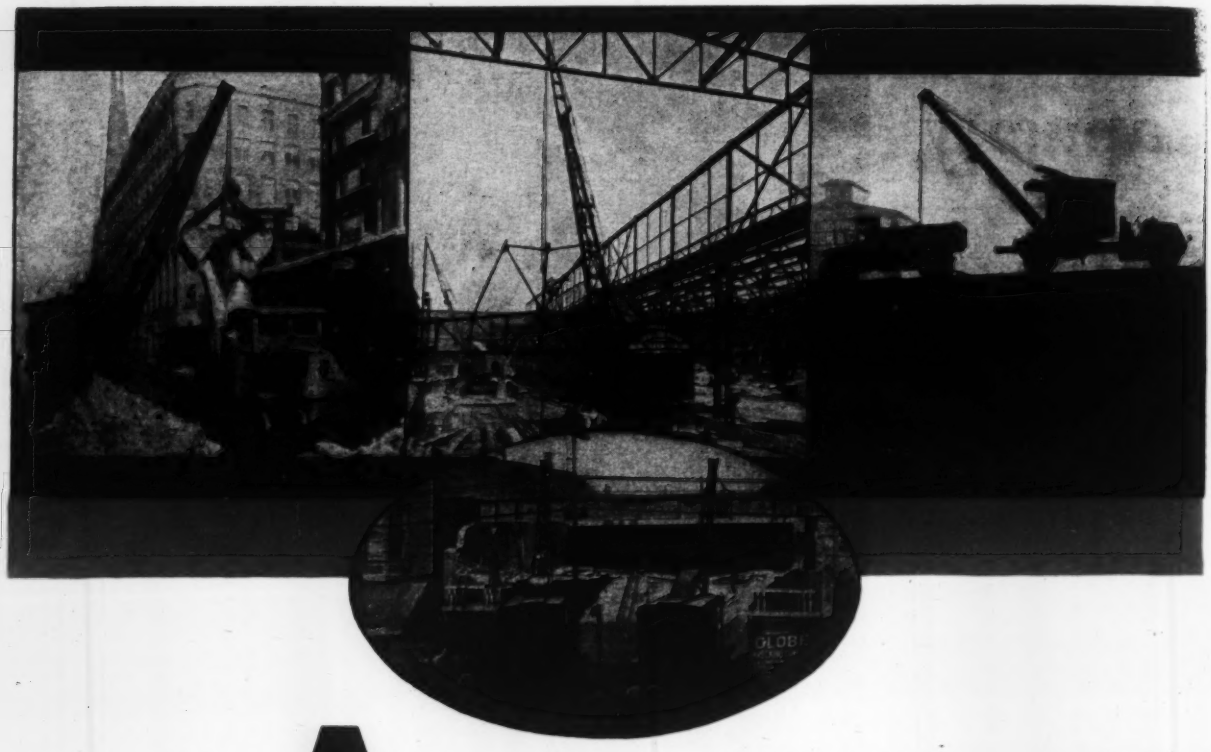
New York, Buffalo, Utica, Rochester, N. Y. · Philadelphia, Pittsburgh, Scranton, Pa., Boston · Cincinnati, Cleveland, Detroit, Chicago · Milwaukee, St. Louis, Charleston, W. Va., Denver · Salt Lake City, Birmingham, Houston

JEFFREY MANUFACTURING COMPANY, Ltd. of Canada
Head Office and Works: Montreal - Branch Office: Toronto

Jeffrey Products

- Elevators—Conveyors
- Trolley Conveyors
- Portable Loaders
- Coal and Ashes Handling Equipment
- Chains and Attachments
- Sprocket Wheels—Gears
- Crushers—Pulverizers
- Sand and Gravel Handling, Washing and Screening Equipment
- Locomotives

JEFFREY
MATERIAL HANDLING EQUIPMENT



A machine
THAT MAKES MONEY
During the Offseason

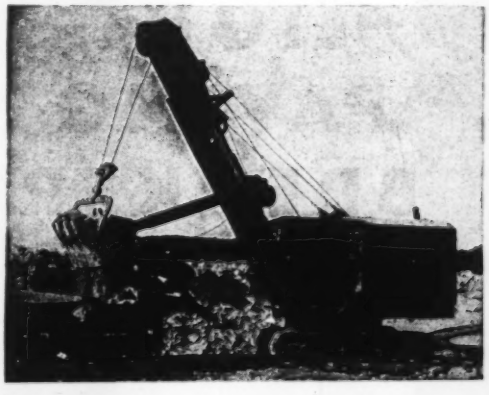
A UNIVERSAL TRUCK CRANE, traveling at motor truck speed, has a working radius of 125 miles. And in this radius there are always short crane jobs—winter or summer—that can be handled profitably by a fast mobile crane. Temporary bridges, repairing damages caused by storms, snow removal, road repairs, coal unloading—these are a few of the 101 offseason jobs that open up for the owner of a Universal Truck Crane.

THE UNIVERSAL CRANE COMPANY
Lorain, Ohio

UNIVERSAL

ARE You Paying For an Industrial Brownhoist ~ ~ Without Owning One?

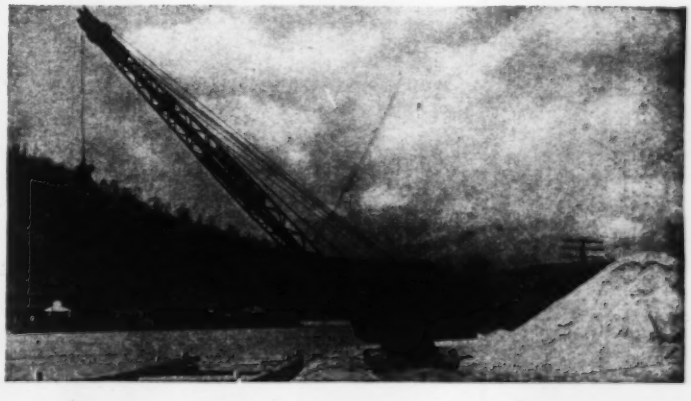
Are you spending thousands of dollars every year on inefficient handling methods—money which could be more profitably applied toward the purchase of a good Crawler or Locomotive Crane? The savings effected by one of these machines would soon pay for it and from then on dividends would quickly pile up.



The Type DC Gas Crawler Crane illustrated is a fast operating, convertible machine of 15 tons capacity. Construction features include two speed hoist, two speed travel, and steering independent of all other motions with any degree of traction on both crawlers, for sharp or gradual curves.

Owners of DC machines will tell you that it is the best crane of its capacity on the market, but it may not be the type best fitted for your work. The nearby Industrial Brownhoist representative can help you decide this point, without prejudice, because we build many sizes of both crawler and locomotive cranes, with gas, steam, Diesel or electric power.

The fact that every Industrial Brownhoist is suited to its work is one reason why there are far more of these cranes in service than any other make.

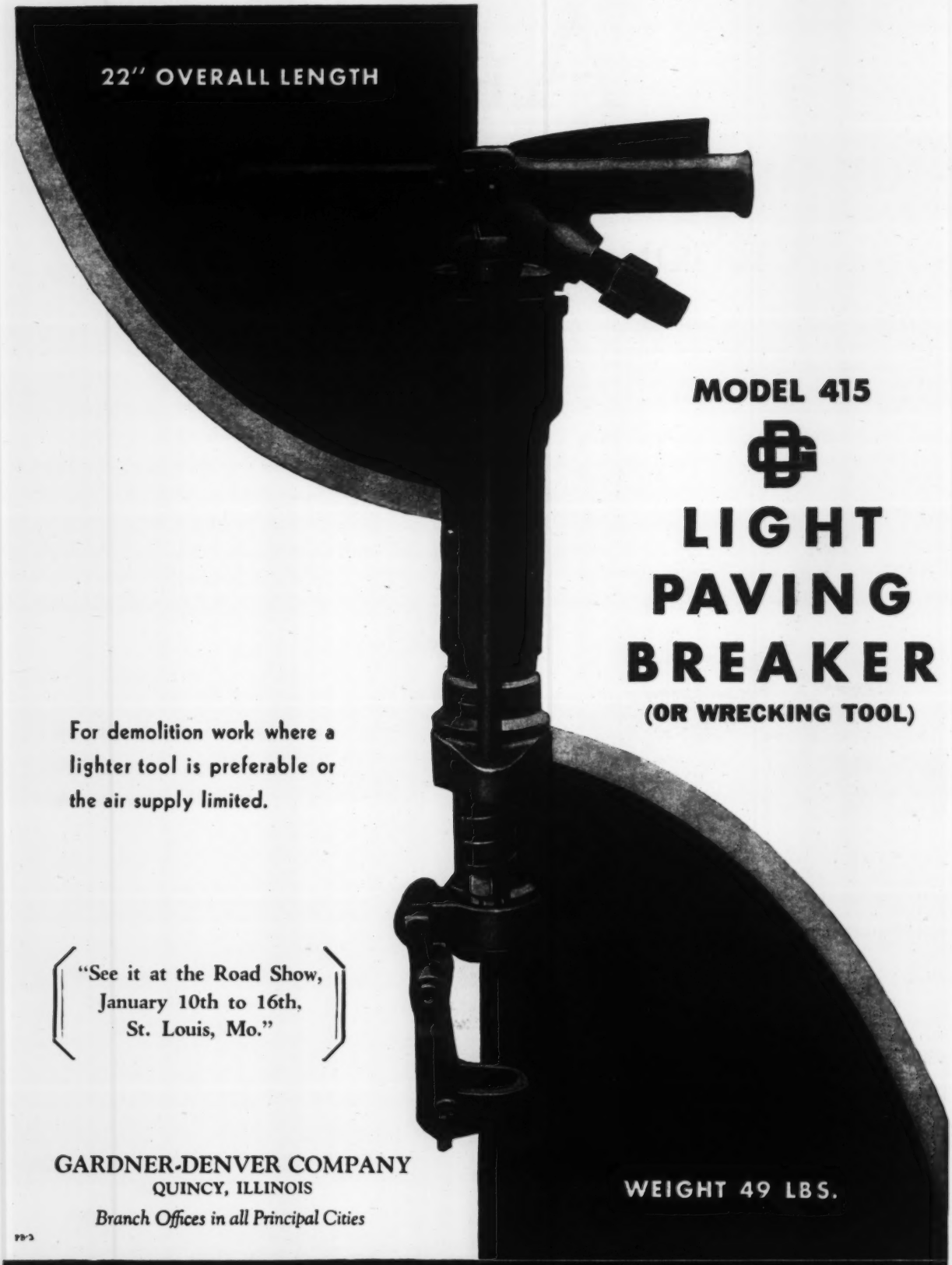


Industrial Brownhoist Corporation, General Offices, Cleveland, Ohio

District Offices: New York, Philadelphia, Pittsburgh, Detroit, Chicago, New Orleans, San Francisco, Cleveland.

Plants: Brownhoist Division, Cleveland; Industrial Division, Bay City, Michigan; Elyria Foundry Division, Elyria, Ohio.

INDUSTRIAL BROWNHOIST



MODEL 415

LIGHT PAVING BREAKER

(OR WRECKING TOOL)

For demolition work where a lighter tool is preferable or the air supply limited.

"See it at the Road Show, January 10th to 16th, St. Louis, Mo."

GARDNER-DENVER COMPANY
QUINCY, ILLINOIS
Branch Offices in all Principal Cities

GARDNER-DENVER

LOOKING STRAIGHT AHEAD

We enter the New Year, 1931, with serene confidence based upon a projected construction program unparalleled in the history of the nation.

During the past year, despite unfavorable economic conditions, Transit Mixers, Inc., has forged ahead and added new and stronger links to its nation-wide chain of successful Operators.

Operating economies will play an increasingly important part in the great period of building activity before us, hence the use of TRANSIT Mixers for the production of economical strength concrete is certain to keep pace with the accelerated scale of operations.

To the entire building industry, we prophesy a year of unparalleled achievement, and in a sincere spirit of confidence, we extend to everyone the prediction for

A Merry Christmas
And a Happy and Prosperous
New Year

We will exhibit at the Road Show, St. Louis, January 10th to 16th, inclusive.

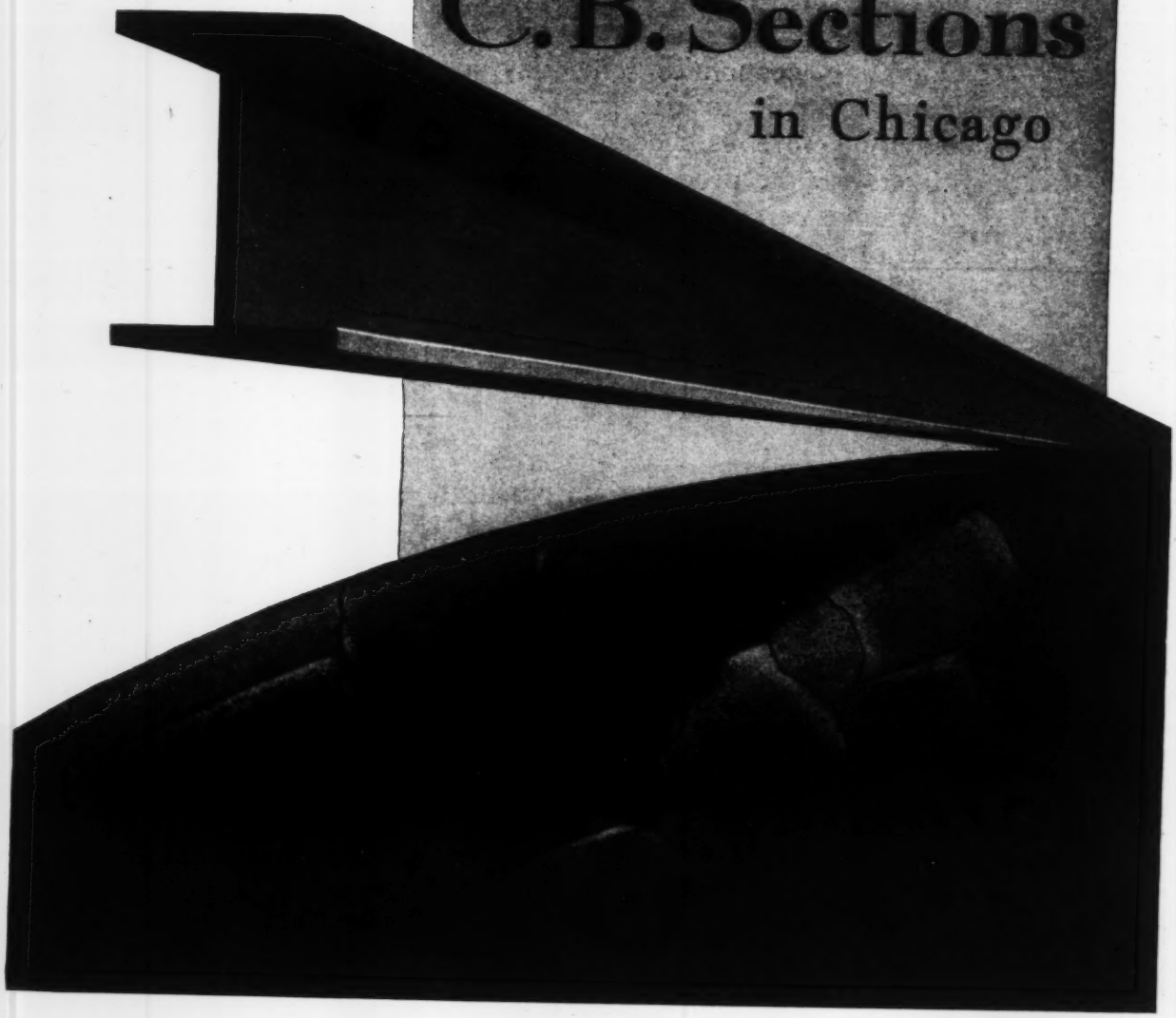
Illinois Steel Company

Subsidiary of United States Steel Corporation

soon will announce the production of

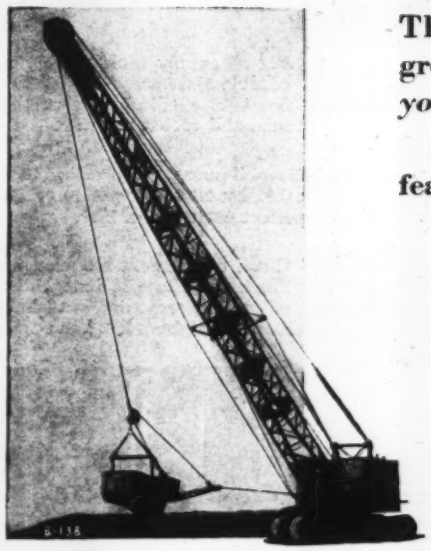
C.B. Sections

in Chicago



SOFT GROUND work is FAST work

for this new Diesel 2-2½ yd.



The 52-B dragline protects your profits in soft ground. The extra-long, extra-wide mountings *keep you on top* of the soft stuff — swinging pay dirt.

And this machine has many other money making features:

- **You can swing and propel at the same time.**
- **Steers from the operator's position — sharp or gradual turns.**
- **Loads on a flat car without dismantling.**
- **A big, slow speed, six cylinder Diesel Engine.**
- **All high speed shafts mounted on ball or roller bearings.**
- **Transmission, swing reversing and below-deck gears all enclosed and run in oil.**

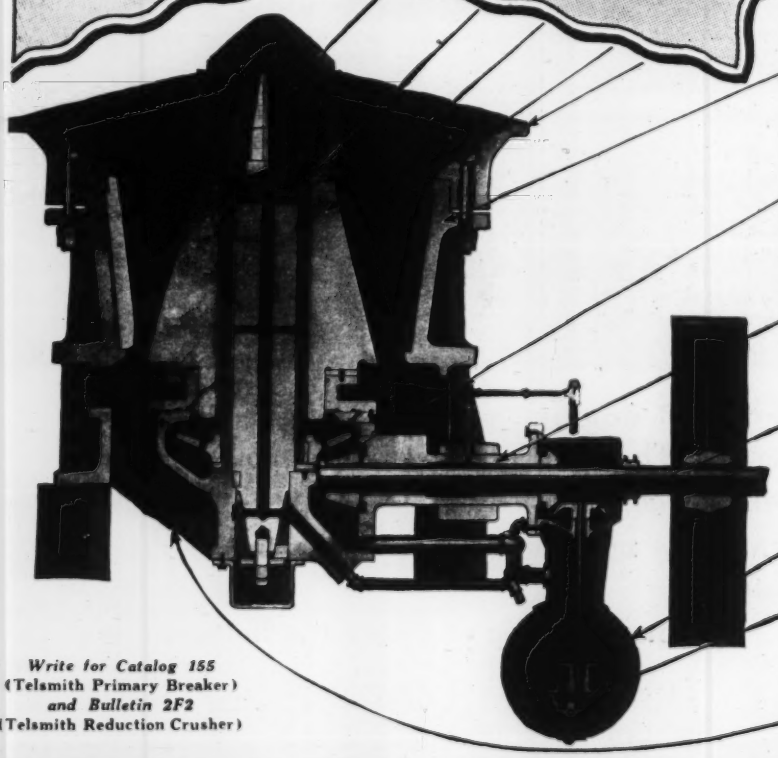
Before you bid again, get the facts. The 52-B Bulletin is yours for the asking.

A-209—12-23-30—ENR

BUCYRUS ERIE

BUCYRUS-ERIE COMPANY, South Milwaukee, Wis. Offices or distributors in principal cities.

Only ONE Crusher has ALL these features



1 Fixed shaft, guaranteed against breakage even by tramp iron. Held rigidly at top and bottom by expansible bushings. This shaft serves as a huge steel bolt through the whole crusher.

2 Long sleeve eccentric, rotating on fixed shaft. Eccentric bearings are three times greater than in other gyratory crushers. Renewable babbitt sleeves.

3 Crushing cone gyrates horizontally. The crushing pinch is as long at top of head as at bottom of the bowl. Exerts full stroke on the big chunks just as they enter crusher. Very little slippage even with gravel boulders.

4 Head and concave diameters are both greater than in other gyratory crushers, with consequent increase in receiving openings and crushing areas.

5 Low-arched, heavily metalled crown. Made of STEEL, guaranteed against breakage by tramp iron.

6 Frame is short—with thick walls and heavy ribs. It is made of STEEL, and guaranteed against breakage, even by tramp iron.

7 Steel drive gears, practically noiseless. Run in oil bath. Teeth never strip until worn out.

8 Removable countershaft box with renewable babbitt bushings, automatic lubrication and sight feed.

9 Pump drive gears are steel, completely housed with sight feed oiler.

10 Big oil supply tank, readily accessible and easily cleaned. Oil flow subject to instant inspection. All oil strained and cooled before re-use.

11 Gear oil pump. All bearings lubricated by oil under pressure, with perfect exclusion of dirt.

12 Clean discharge. No clogging. Discharge chute is independent of crusher structure, attachable at any position. No right or left-hand drive.

Write for Catalog 155
(Telsmith Primary Breaker)
and Bulletin 2F2
(Telsmith Reduction Crusher)

TELSMITH

Consult the nearest representative or write or wire direct to TELSMITH

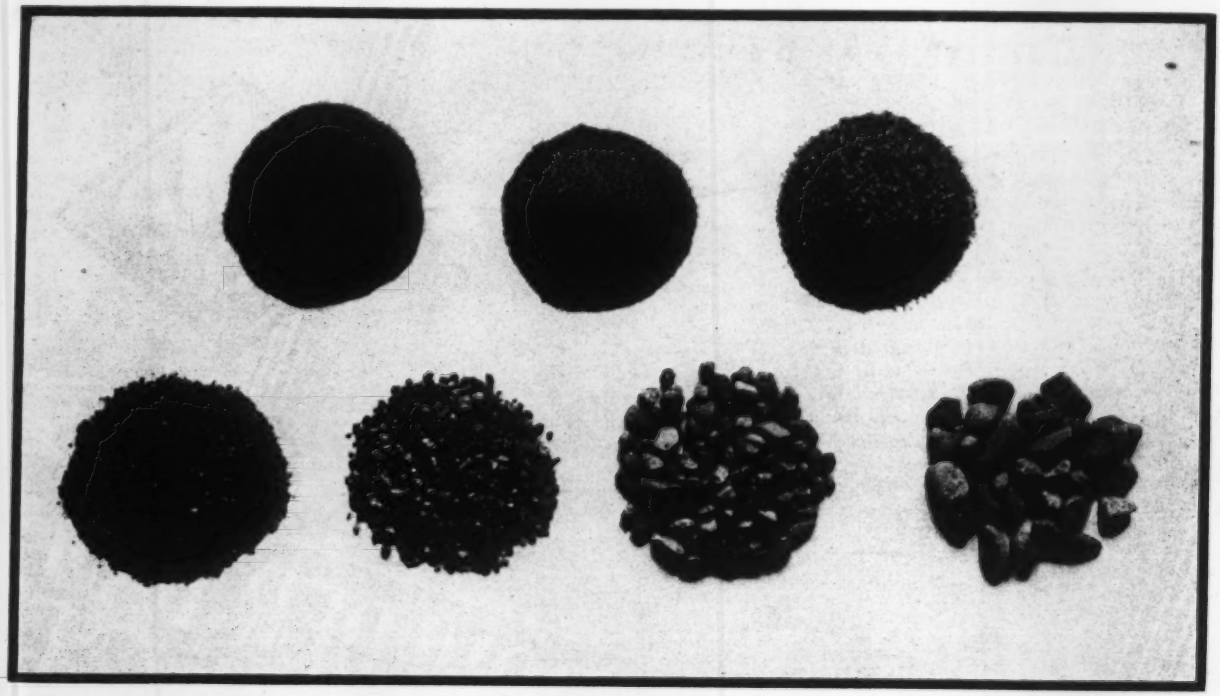
CANADIAN REPRESENTATIVES: Canadian Ingersoll-Rand Co., Ltd., Montreal, P. Q.

11 West 42nd St., New York City	1442 Builders Bldg. Chicago, Ill.	Harrison Bldg., Philadelphia, Pa.	K. B. Noble Co., Hartford, Conn.	Clark & Freeland, Inc. Baltimore, Md.
W. G. Kerr Co., Pittsburgh, Pa.	1367 East 6th St. Cleveland, Ohio	Knox Eng. & Eq. Co., Indianapolis, Ind.	Brandeis M. & S. Co., Louisville, Ky.	V. L. Phillips Co., Kansas City, Mo.
Borchert-Ingersoll, Inc. St. Paul, Minn.	Graham B. Bright, Richmond, Va.	Choctaw C. & M. Co., Memphis, Tenn.	G. B. Mueller Co., Birmingham, Ala.	J. W. Bartholow Co., Dallas, Texas

SMITH ENGINEERING WORKS B-14

80 CAPITOL DRIVE MILWAUKEE, WISCONSIN

LIMA "101"
LIMA "101" is the only shovel in the world equipped throughout with roller bearings—a Timken at every vital point!
BOULDER CANYON PROJECT
MERRITT CHAPMAN & SCOTT CORP.
first! ON THE BOULDER DAM PROJECT
SELECTED as the first shovel to begin operation on the Boulder Dam Project at Las Vegas, Nevada, by the Merritt, Chapman, Scott Corporation, LIMA "101" has earned its way to recognition by the country's most successful contractors on performance records second to none. Write to any LIMA "101" owner for proof.
Get a copy of Bulletin 301 which describes the many advanced and profit making features in the LIMA "101".
The Ohio Power Shovel Company
Division Lima Locomotive Works Incorporated
LIMA, OHIO
Eastern Office
2351 Graybar Bldg.,
New York
Canadian Representatives
The General Supply Co. of Canada, Ltd., Ottawa, Ont.
Tyee Machinery Co., Ltd., Vancouver, B. C.
Western Office
846 Straus Bldg.,
Chicago, Ill.
TIMKEN BEARING EQUIPPED
LIMA "101"
PENNSYLVANIA
MORE THAN HALF A CENTURY OF QUALITY WORKMANSHIP IS BACK OF EVERY LIMA "101"



Like peas in a pod

are each of the seven sand and gravel sizes used for making uniform batches of test concrete

Step into one of the experimental rooms of the Lehigh Central Laboratory at Ormrod, Pa., where control tests are constantly made to insure the uniformity of Lehigh Cement, and you will see many kinds of crushing, grinding and screening devices. It is here that sand and gravel are so accurately measured that the particles in any one grade finally match like so many peas in a pod.

These various sizes of aggregates are eventually recombined in specified amounts into a standard, uniform batch. Each grade of sand and gravel is accurately proportioned by weight and there is consequently little or no variation in the physical character of the test concrete mixed in the laboratory. Every batch is the same.

In such ways, uniformity of conditions are insured when testing Lehigh Cement at the Central Laboratory. This system of central control, together with the hourly tests in the Laboratories located at each Lehigh mill, has made the word "Lehigh" on a bag of cement the symbol of dependability.

High-Early-Strength Concrete with Lehigh Cement

Successful jobs all over the country show that perfect high-early-strength concrete is readily obtained at lower cost by using standard Lehigh Portland Cement. No special or expensive materials are necessary.

Lehigh Portland Cement Company

Allentown, Pa.; Chicago, Ill. • *Offices in Principal Cities*

LEHIGH CEMENT

"Lehigh" *means* Dependability

MILLS FROM COAST TO COAST

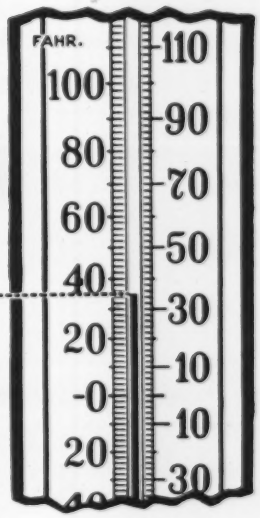
WINTER WATERPROOFING and DAMPPROOFING

—to rush them *with safety* use

HEADLEY EMULSIFIED ASPHALTS

Cold surfaces chill hot-applied asphalts before they can bond—freezing ruins clay-suspended asphalts unless they are loaded with anti-freeze compounds which affect the protective properties of the finished coating. Cut-back asphalts invite trouble at all times on account of the dangerously flammable ingredients. With Headley Emulsified Asphalts Winter Waterproofing or Dampproofing can proceed except under extremely adverse conditions since these asphalts are not harmed by freezing.

These days are all work days with HEADLEY Emulsified ASPHALTS



—and these days never injure the raw material

PRINCIPAL USES

- Dampproofing and waterproofing of foundations, basements, tunnels, reservoirs, sumps, pits, cisterns, vats, tanks, floors, walls, roofs, etc.
- Protection of concrete and masonry against distintegration.
- Protective coating of concrete, masonry, structural steel, pipe lines, metal, etc., against the destructive influences of fresh and salt water, moisture, gases, chemical fumes, brine, acids and alkalies, etc.
- Bonding and cementing bituminous flooring, linoleum, plaster, stucco, tiles, blocks, slabs, bituminous bridge and crossing planks, fibrous and mineral wall boards, cork board and other insulation, etc.
- Paving and patching of highways, walks, airport runways, railway platforms and crossings, industrial floors, etc.
- Marking lines for highway traffic zones.

Get this FREE SAMPLE and see for yourself

HEADLEY EMULSIFIED ASPHALTS pour, apply and bond perfectly down to almost freezing temperatures. Even though applied during cold Winter weather, the bond, imperviousness and uniformity of the finished coating are unimpaired. Nor is heated storage of the material necessary.

This perfect performance in cold weather, this ability to withstand freezing and thawing without impairment is a life-saver to many a contractor on a rush Winter job. Headley Emulsified Asphalts can be applied with equal facility Summer or Winter. No skill, tedious mopping or antiquated heating plant are required.

If you wish to know what Headley Emulsified Asphalts have done or will do under given conditions, or if you desire suggestions and specifications on a given job, give us the details, or ask for Bulletin No. 330 on Waterproofing, Dampproofing and Protective Coatings.

Headley Emulsified Asphalts are shipped in tank cars, 50-55 gal. or 30-33 gal. drums or 5-gal. and 1-gal. steel pails. Ask for quotation and coverage data.

HEADLEY EMULSIFIED PRODUCTS CO.

Emulsified Asphalts for Industrial Uses. Largest Exclusive Manufacturers since 1908.

Franklin Trust Bldg., PHILADELPHIA

Branch Offices, New York and Chicago. Works, Marcus Hook, Pa.

☐ Send Bulletin 330 on Waterproofing, Dampproofing and General Protective Coating.

☐ Send sample of Headley Emulsified Asphalt.

Name .....

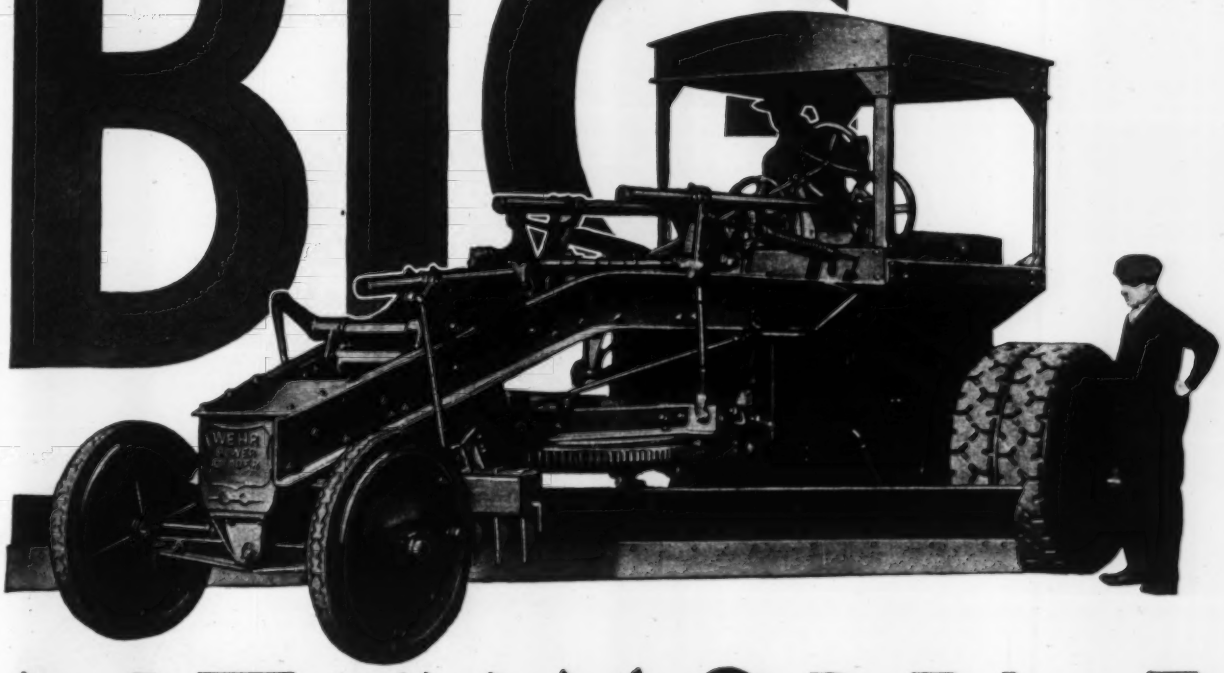
Address .....

ENR .....

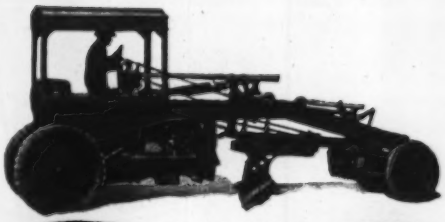
BECAUSE Eldorado does all the things a good drawing pencil should . . . and does them better . . . it is hailed the world around as "The Master Drawing Pencil." Countless engineers and draftsmen know it by no other name. If you're not already one of them, we'll send you a free engineer's sample kit . . . to prove Eldorado's unending excellence on all kinds of jobs. That puts it up to you, doesn't it? Joseph Dixon Crucible Co., Pencil Dept. 227-J, Jersey City, N. J.

ANNOUNCING THE

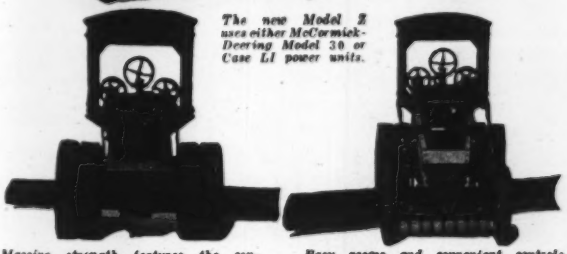
BIG



NEW MODEL-Z WEHR GRADER



The new Model Z uses either McCormick-Deering Model 30 or Case L1 power units.



Massive strength features the construction of this efficient new machine.

Easy access and convenient controls are illustrated in this rear view of the Model Z.

A GREAT new grader — built to BIG specifications — to establish BIG records of performance!

It's a real giant for road-maintenance jobs. Investigate the possibilities of this latest Wehr development—they are of profitable interest to every road man!

Write for detailed description, and see the Model Z at the St. Louis Road Show. You'll find it the center of attraction at the Wehr Booth, No. A63—it will be the grader everyone's talking about!

WEHR COMPANY

Milwaukee, Wis. *Factory*, Cudahy, Wis.

See the complete Wehr line, including the Great New Model Z, at the Good Roads Show, St. Louis, January, 10 to 16.

WEHR

ROAD EQUIPMENT

EVERYDAY ROUTINE —THESE "SPECIALS"

"Lynchburg Plants" are equipped with experience and machinery to produce UNUSUAL FITTINGS in both size and shape of the highest quality on short notice. Many "Specials" in other foundries are actually every-day routine at "Lynchburg Plants."

When you need a Fitting *quick*, wire Lynchburg.

Bell and Spigot Pipe and Fittings from 4 in. to 48 in.

Cast Iron Flanged Pipe from 3 in. to 84 in.

Cast Iron Flanged Fittings and Flanges from 1 in. to 84 in.

de Lavaud Centrifugal Cast-Iron Pipe

General Office: LYNCHBURG, VA.

Peoples Gas Bldg. CHICAGO, ILL.

50 Church St. NEW YORK, N. Y.

36" Flanged Pipe with Special Ribbed Outlets

Special Offsets and Bends

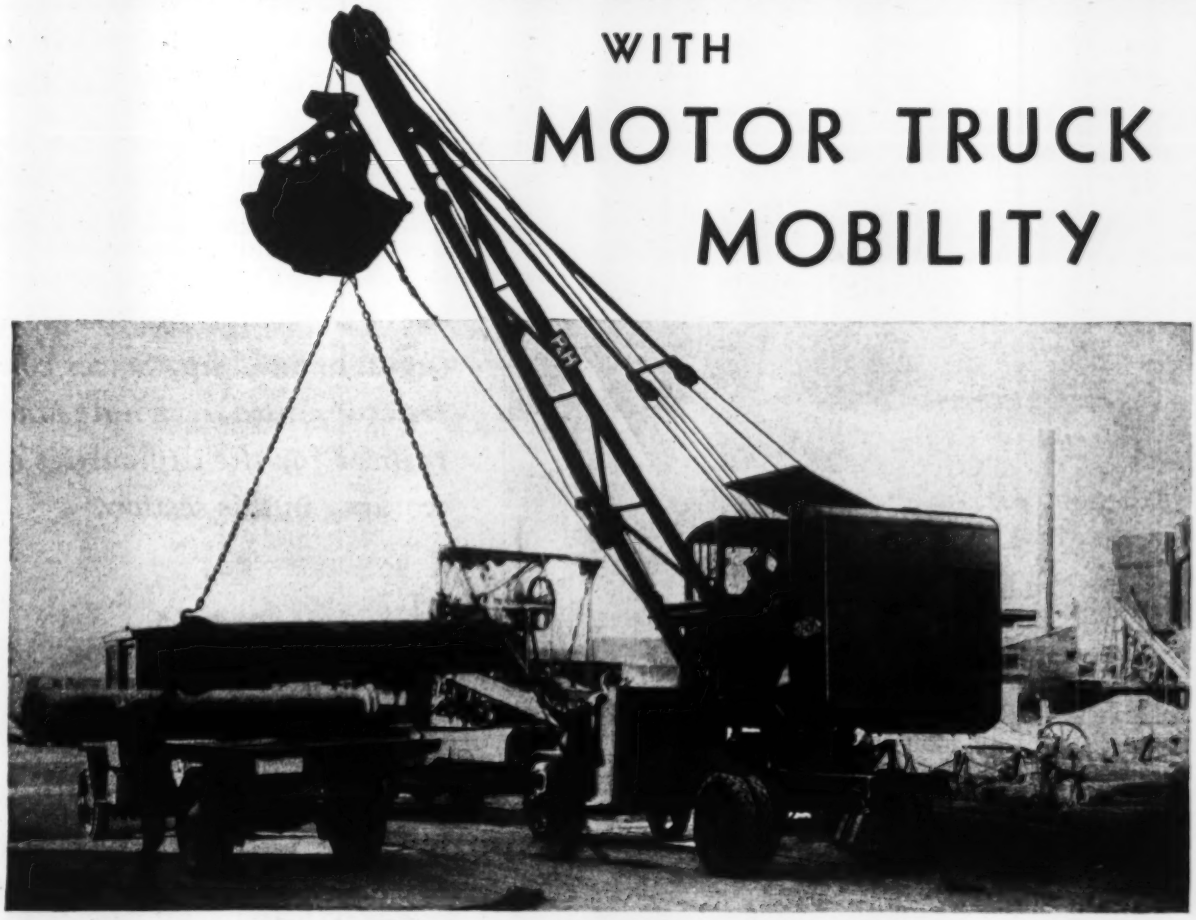
Special Intake Fittings

L.F.C.

LYNCHBURG FOUNDRY CO.

LYNCHBURG, VA.

A FULL REVOLVING CRANE WITH MOTOR TRUCK MOBILITY



P & H TRUCK CRANE

Built in Capacities of 5, 6 and 7½ tons

THE complete range of usefulness of a revolving crane is fully and quickly available through this handy unit. ¶ The P & H Truck Crane is a standard P & H half-yard revolving crane. But instead of the usual slow crawlers, it is mounted upon a truck chassis. Thus it makes crane service available at truck speed. It will travel with your trucks or move rapidly about your plant or storage yard, handling bucket, sling, hook or magnet with equal efficiency. ¶ Write for bulletin TC-1, which describes the P & H Truck Crane in detail.

HARNISCHFEGER CORPORATION
Established in 1884
Truck and Trailer Crane Division
4404 W. NATIONAL AVENUE, MILWAUKEE, WISCONSIN
Offices and Agents in All Principal Cities
WAREHOUSES AND SERVICE STATIONS:
Hoboken, Memphis, Jacksonville, San Francisco, Los Angeles, Seattle, Dallas

This big, concrete pipe job is in a "wringing wet" section of Queens, in New York City. Years ago it was a duck's paradise. The material from the city trucks gradually raised it out of the water and the place began to build up. Sewer contractors had a wholesome respect for the difficulties of working in this section.

That was before the MORETRENCH WELLPOINT SYSTEM came along. A Four-Pump Outfit pulled the water down and threw it out. The hardship was thrown out with it. "Tony" and "Johnny" are on the work. They wear a special boot—not rubber. Seven League style—just to kick the job along.

You ask 'em!

THE MORETRENCH WELLPOINT SYSTEM
MAKES EVERY JOB A DRY JOB
Anytime—Anywhere—Under Any Condition

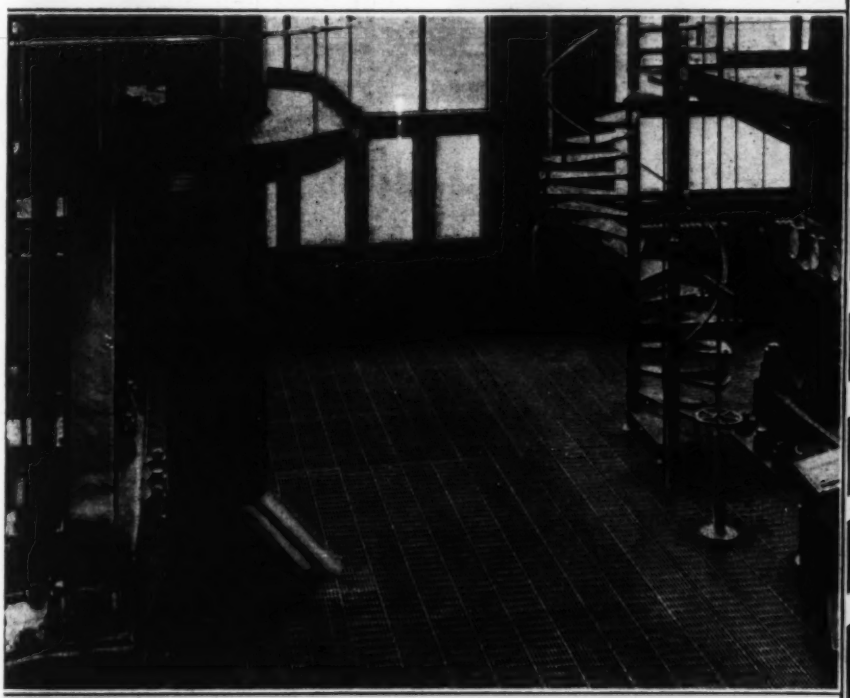
Moretrench
MOORE TRENCH MACHINE CO. *Rockaway, N. J.*
CONVEYING EXCAVATORS
WELLPOINT SYSTEM

Electroforged Grating for Open Floors and Stairways

is a rigid, *one piece* structure fabricated without recourse to bolts, rivets, slotting or punching of metal. Its use assures a floor conforming to modern engineering practice, providing the very maximum of open area for light and air, accessibility for painting, non-slip safety and a total absence of looseness and rattling. Individual sections of Electroforged Grating may be easily lifted to permit passage of materials or machinery to and from basement. Your request to our nearest office will bring catalog and full size sample for examination at your leisure.

BLAW-KNOX COMPANY
2001 Farmers Bank Bldg., Pittsburgh, Pa.
New York Chicago Boston Detroit Buffalo
Philadelphia Birmingham Cleveland Baltimore
Export Division:
Blaw-Knox International Corporation, Canadian Pacific Bldg., New York

London, England, New Oxford House, Hart St., Holborn, W. C. 1.—Paris, France, 1 Rue de Clichy—Milano, Italy, 6, via S. Agnese, 6—Dusseldorf, Germany, 17 Bismarckstrasse



Installation of Blaw-Knox Electroforged Grating, Lardners Point Pumping Station for City of Philadelphia

BLAW-KNOX

TRADE MARK REG. U.S. PAT. OFFICE BLAW-KNOX

KOEHRING 401 . . . BRUTE STRENGTH

Heavy Duty No. 401 Shovel built by the Koehring Divison of the National Equipment Corporation, Milwaukee, Wis.

New Departure

..NIMBLE, WITH 25 NEW DEPARTURES

The man behind the levers of a 401 shovel, is the first to find what New Departure Ball Bearings have done for this equipment. Levers are lively with responsive power. Smoothness prevails at every speed. Hours of tinkering and oiling are eliminated because these wear-resisting bearings are housed so that dirt cannot enter — lubricant cannot escape. At the season's end the owner realizes the economy of New Departures — their ability to stand abuse without mechanical attention. More dirt per day is moved — at less cost. An increasing demand for this fast and powerful shovel proves the soundness of Koehring design and the wisdom in the choice of bearings. These sturdy, self-contained New Departure Ball Bearings increase the useful life of any construction machine. The New Departure Mfg. Co., Bristol, Connecticut; Detroit, Chicago, San Francisco.

NOTHING ROLLS
LIKE A BALL

Ball Bearings

AUSTIN BACKFILLER

FULL REVOLVING

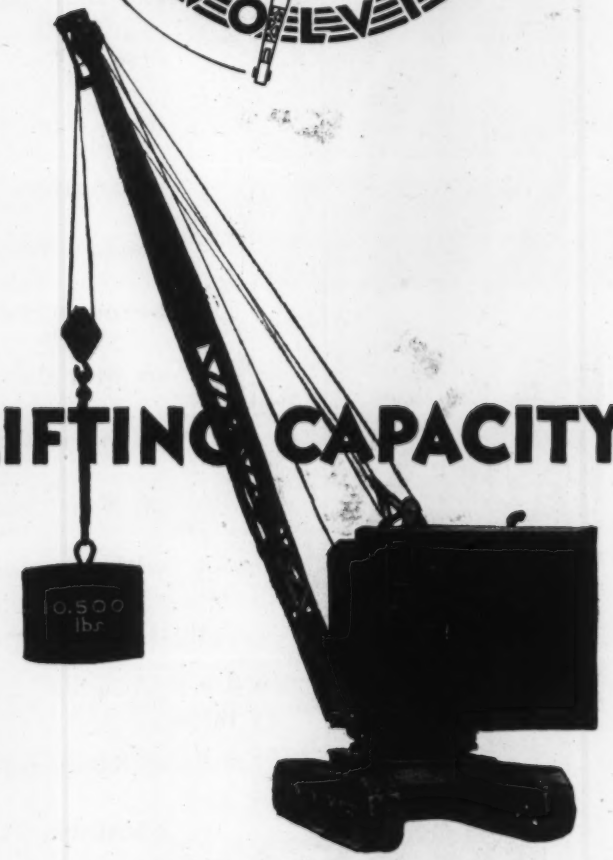
LOW FIRST COST

EFFICIENT

ECONOMICAL

DEPENDABLE

UNEQUALLED LIFTING CAPACITY FOR SIZE OF MACHINE.



10,500 POUND LIFTING CAPACITY

SUCCESSFUL IN EVERY APPLICATION BY REASON OF ITS GREATER SIMPLICITY AND PROVED PERFORMANCE. FAST IN OPERATION, LOW IN MAINTENANCE AND ADAPTABLE TO MANY CLASSES OF WORK.

DESCRIPTIVE CATALOG ON REQUEST

CRANE, CLAMSHELL OR DRAGLINE

AUSTIN
MACHINERY CORPORATION
MUSKEGON • MICH.

District Offices:—Newark, N. J., 326 Frelinghuysen Ave. Cleveland, Ohio, 1943 W. 100th St. Toledo, Ohio, Canterbury Court, Ottawa Hills. Chicago, Illinois, 315 Railway Exchange Bldg. St. Louis, Mo., 1504 No. Broadway. Dallas, Texas, 209½ N. Clinton St. Los Angeles, Calif., 2411 E. 26th St., H. C. Collins Co. Toronto, 3 Ontario, Canada, 17 Waller Avenue.

Representatives in most principal cities throughout U. S. A. and Canada

Parsons Model 40 Excavator hard at work for the Mondo Construction Company, near Syracuse, New York

The owner of a machine powered with a Twin City Engine is likely to be a confident sort of man. He knows his engine and does not worry when he is on a job where the going is a little tougher than usual. He knows that it will outlast the ordinary engine and give him many years' service at a very low cost of upkeep.

A Twin City Engine assures the reliable power performance of the machine in which it is installed. Job after job, year after year, it goes right through no matter how hard the work. The Twin City has been giving the utmost satisfaction for twenty-six years, and many of the foremost power machinery manufacturers have recognized the value of such a record by using this engine in their equipment.

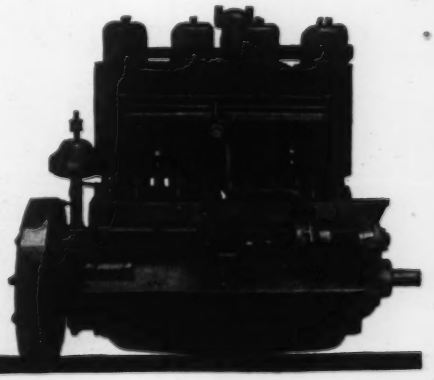
Twin City Engines are manufactured by the Minneapolis-Moline Power Implement Company, Minneapolis, Minnesota, and are found in machines made by the following manufacturers:

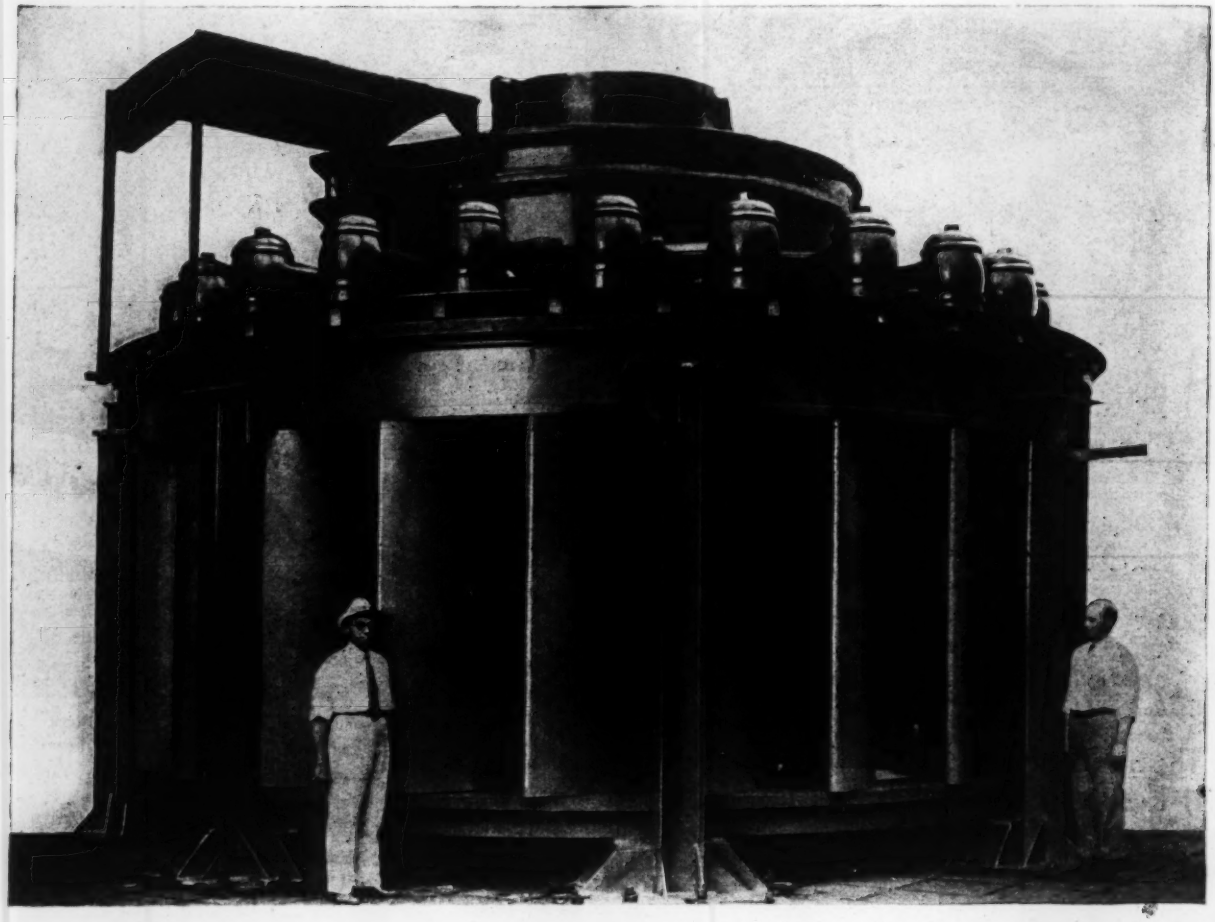
Northwest Engineering Company
Browning Crane Company
The Parsons Company
Austin Machinery Corp.
Buckeye Traction Ditcher Company
Sargent Machine Company
Cement Gun Contracting Company
Star Drilling Machine Company

TWIN CITY ENGINES

Twin City Engines and Parsons

40 TO 140 H.P.





SHOP ASSEMBLY OF
57000 HORSEPOWER 81 FOOT HEAD TURBINE
SPIER FALLS DEVELOPMENT
NEW YORK POWER & LIGHT CORPORATION

Designed and built by
Hydro-Electric Division

Newport News Shipbuilding & Dry Dock Co.

Newport News, Virginia — New York, 233 Broadway

Non-clogging Sewage Pumps
—horizontal and vertical types

MORRIS Non-Clogging Sewage Pumps will pass pulp and semi-solids, rags, sticks and even solid blocks without danger of clogging or breaking. The impellers are especially designed to handle the vast assortment of materials carried through sewer lines, and all parts are proportioned with exceptional sturdiness to withstand hard wear.

Handholes at the suction entrance, and horizontally split casings provide ready access to the interior of the pump, and many exclusive features assure maintenance of high initial efficiency, thoroughly dependable service, protection from end thrust, and effective lubrication.

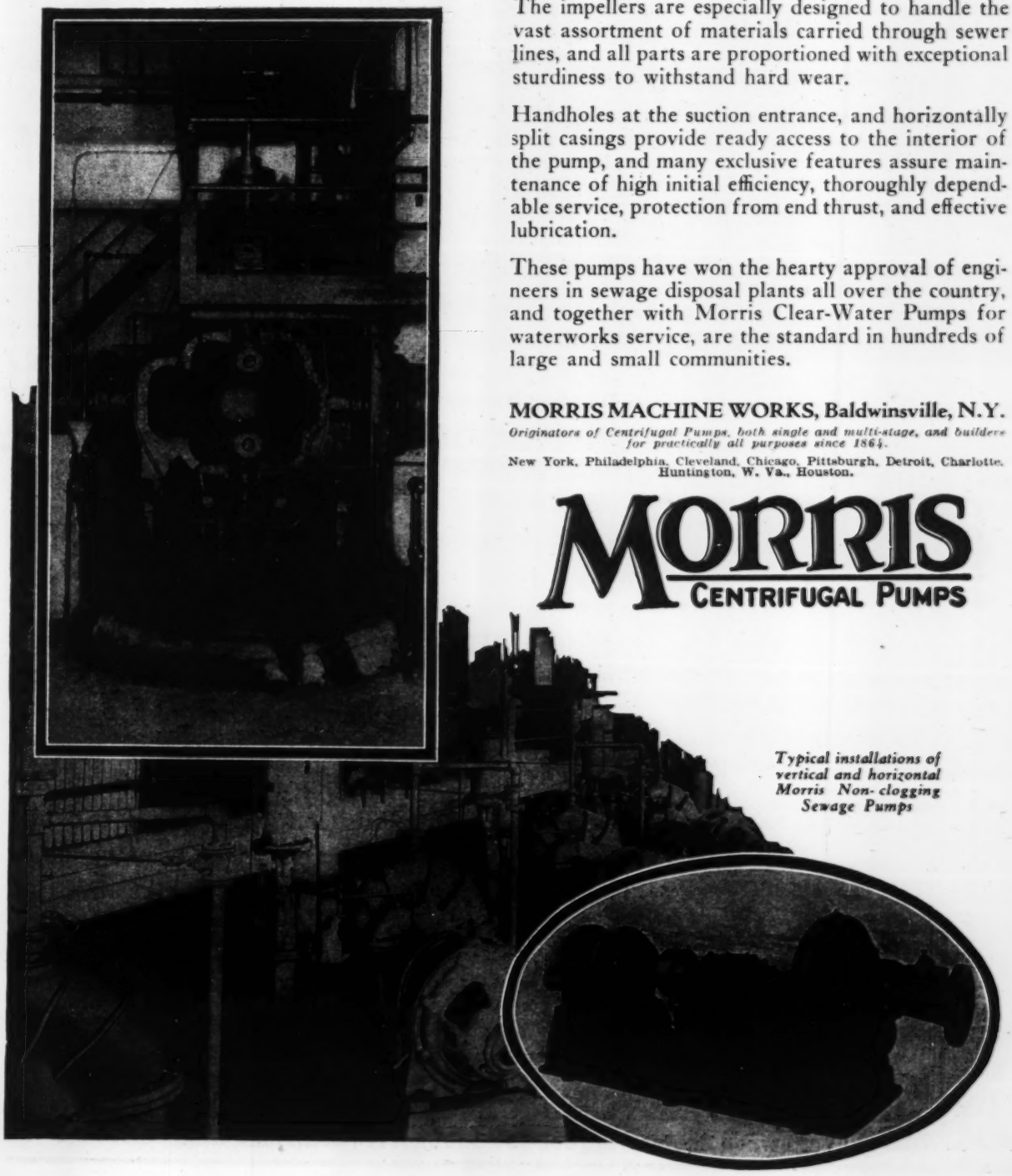
These pumps have won the hearty approval of engineers in sewage disposal plants all over the country, and together with Morris Clear-Water Pumps for waterworks service, are the standard in hundreds of large and small communities.

MORRIS MACHINE WORKS, Baldwinsville, N.Y.

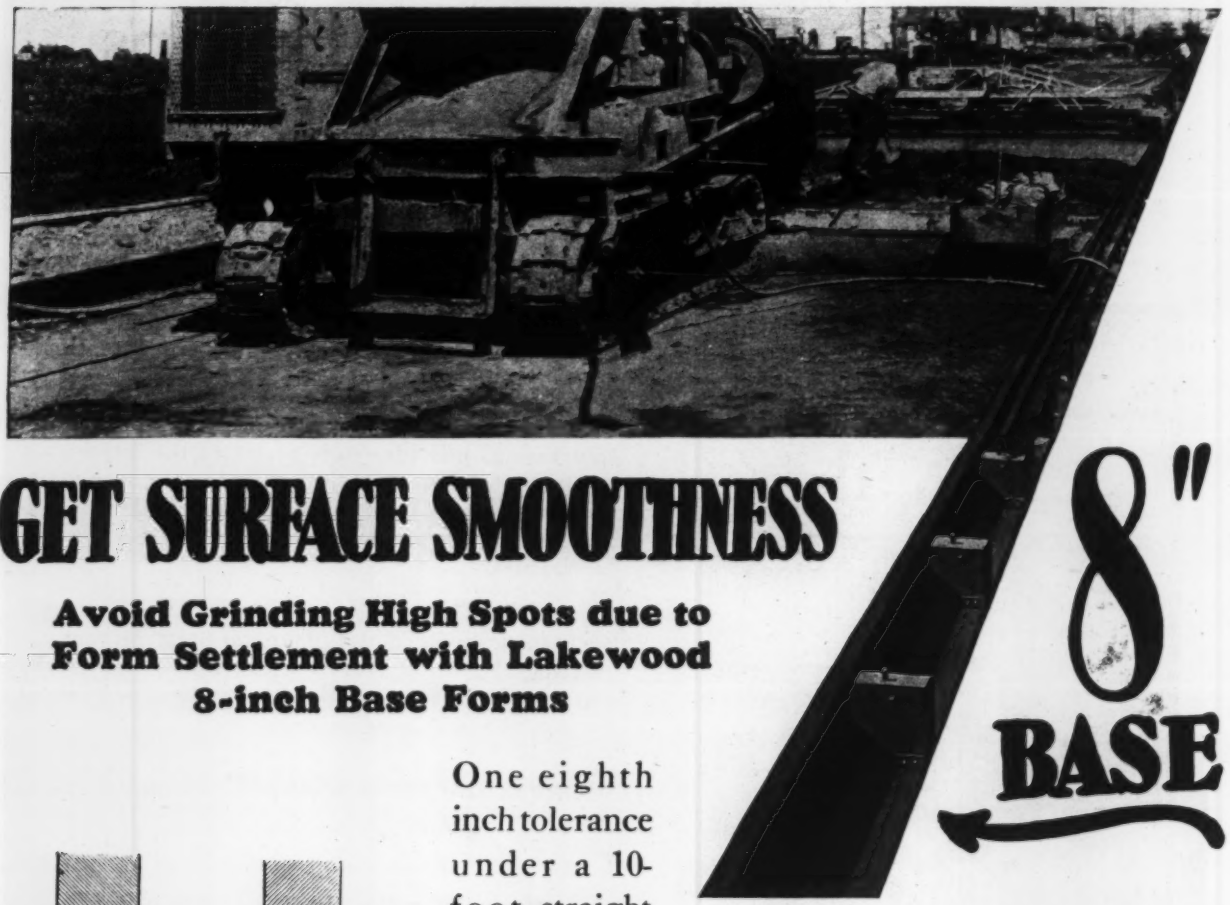
Originators of Centrifugal Pumps, both single and multi-stage, and builders for practically all purposes since 1864.

New York, Philadelphia, Cleveland, Chicago, Pittsburgh, Detroit, Charlotte, Huntington, W. Va., Houston.

MORRIS
CENTRIFUGAL PUMPS



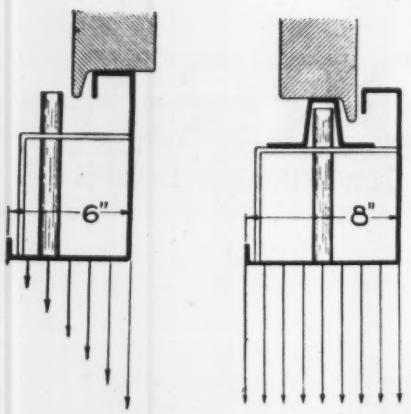
Typical installations of vertical and horizontal Morris Non-clogging Sewage Pumps



GET SURFACE SMOOTHNESS

Avoid Grinding High Spots due to Form Settlement with Lakewood 8-inch Base Forms

One eighth inch tolerance under a 10-foot straight edge is becoming a standard in all states. With heavier machines, including power subgraders, greater bearing value is necessary to prevent form settlement. The Lakewood 8-inch base form gives this extra stability—a constant factor of safety against form settlement under the finishing machine. On soft or sandy subgrades the "Duo-Rail" attachment may be used, requiring a half a dozen lengths on each side of the finisher for a few dollars extra, and giving about 300 per cent added bearing value. The "Duo-Rail" comes in 10-foot lengths and rests on the stake pockets.



The "Duo-Rail" attachment can be used whenever necessary with Lakewood 8-inch base forms and puts the load where it belongs. Gives 300% greater bearing value over the standard 6-inch base form.

Send for details.

EXPORT OFFICES: 30 Church St., New York City • • *CABLE ADDRESS:* Brosites

LAKEWOOD

The Lakewood Engineering Co., 520 Dublin Ave., Columbus, Ohio

Just out—NEW CATALOG 40

Bigger and better than ever—new!

FROM all over the world came the 144 big action photos. Every conceivable kind of pile driving and pile pulling job. Detailed practical construction information on everything from driving light wooden sheeting to giant concrete piles and large timber piles, 80 feet under water—pages and pages of diagrams, "how-to-do-it" drawing, pile bearing-power formulas, specifications, special rigs—a book to study and to use—practically a "text book" of the best in modern pile driving practice. Please use your business letterhead when writing for your copy. Thank you.

√
NEW CATALOG 40
√
SIZE 8½ x 11
√
SCORES OF PAGE PLATES
√

WRITE TO
McKiernan-Terry Corporation
13 Park Row, New York
Distributors in Principal Cities

NATIONAL HOISTS - STEELE & CONDICT BRIDGE MACHINERY

McKIERNAN-TERRY DOUBLE ACTING PILE HAMMERS

A *word about* rope "types" *and* "constructions"

NO one rope "type" nor "construction" is a cure-all for wire rope troubles . . . and occasionally users do have trouble with wire rope. Our standard types and constructions are most satisfactory and serviceable in the majority of instances. When some different type, or construction, promises greater safety or longer service you can get it in Roebling "Blue Center" Steel Wire Rope, too—and feel secure in the knowledge that the rope is built with old-fashioned thoroughness.

JOHN A. ROEBLING'S SONS COMPANY, TRENTON, N. J.
Branches in Principal Cities

Wire, Wire Rope, Welding Wire, Flat Wire *Copper and Insulated Wires and Cables*

ROEBLING "BLUE CENTER" STEEL **WIRE ROPE**

WHY Engineers choose TONCAN IRON CULVERTS

IN specifying culverts, analyze the advantages of Toncan Iron and you'll come to the same conclusions as the hundreds of engineers who have made Toncan Iron culverts their choice.

■ Consider culvert economics. Here the light weight of Toncan Iron culverts cuts handling costs, hauling costs and laying costs. The thin wall means less yardage to excavate. The longer lengths, flexibility and light weight save money in foundations.

■ Then consider culvert durability. Shocks and vibrations have no ill effect on the flexible corrugated construction of Toncan Iron culverts. They are strong to resist breakage and heavy soil loads.

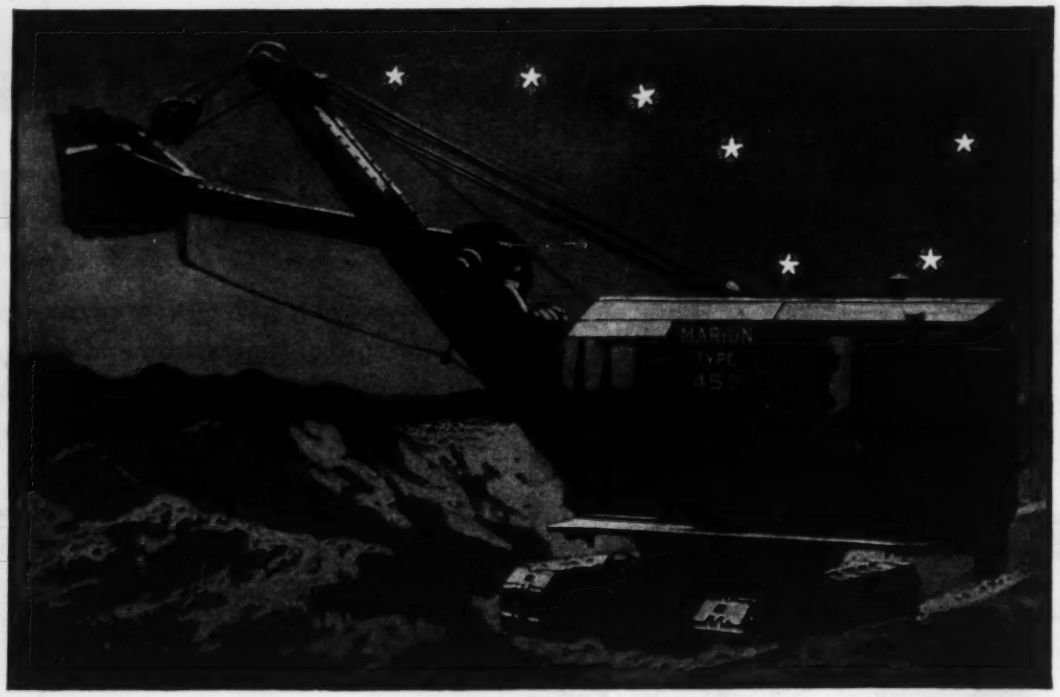
■ Rusting and corrosion make little progress against Toncan Iron—the alloy of refined iron, copper and molybdenum that so successfully combats the inroads of time.

■ On every count, Toncan Iron is the logical choice for culverts.

TONCAN CULVERT MANUFACTURERS' ASSOCIATION

MASSILLON, OHIO

Plants located in all Parts of United States and Canada



The Big Dipper

KEY-POINTER to the North Star, the Big Dipper for centuries has helped navigators to steer safely. A great constellation, it is always and everywhere reliable. ★ The Big Dippers of industry are defined by their achievements. The magnitude of a shovel builder is measured by the length of its experience; the extent of its resources in men, methods and machinery; the value of the ideas it has perfected; the character of the ideals it has pursued; the scope of its abilities; the performance of its products; and the quality and availability of its service. ★ Only with time and hard work can a position like this be reached — but it is well worth it, to be able to serve the man who wants the best. ★

Come to Shovel MARION *Headquarters*

THE MARION STEAM SHOVEL COMPANY

DISTRICT OFFICES — NEW YORK — CHICAGO — PHILADELPHIA — BIRMINGHAM
KANSAS CITY — SEATTLE — SAN FRANCISCO

MARION, OHIO, U. S. A.

Armor-Like...

RED LEAD fortifies against CORROSION

Prolongs the life of iron and steel

AIR and moisture... these are the foes of structural metal. In contact with iron or steel, they shorten its life. Kept away, the metal will last indefinitely.

Protection That Lasts

There's only one way to get the kind of protection that lasts for years. That way, authorities agree, is by using pure red lead.

Here's why. Red lead paint *seals up* metal with a tough, dense, protective coat. Air or moisture cannot reach it. Thus corrosion is practically eliminated. And longer life for the metal is assured.

High Quality Red Lead

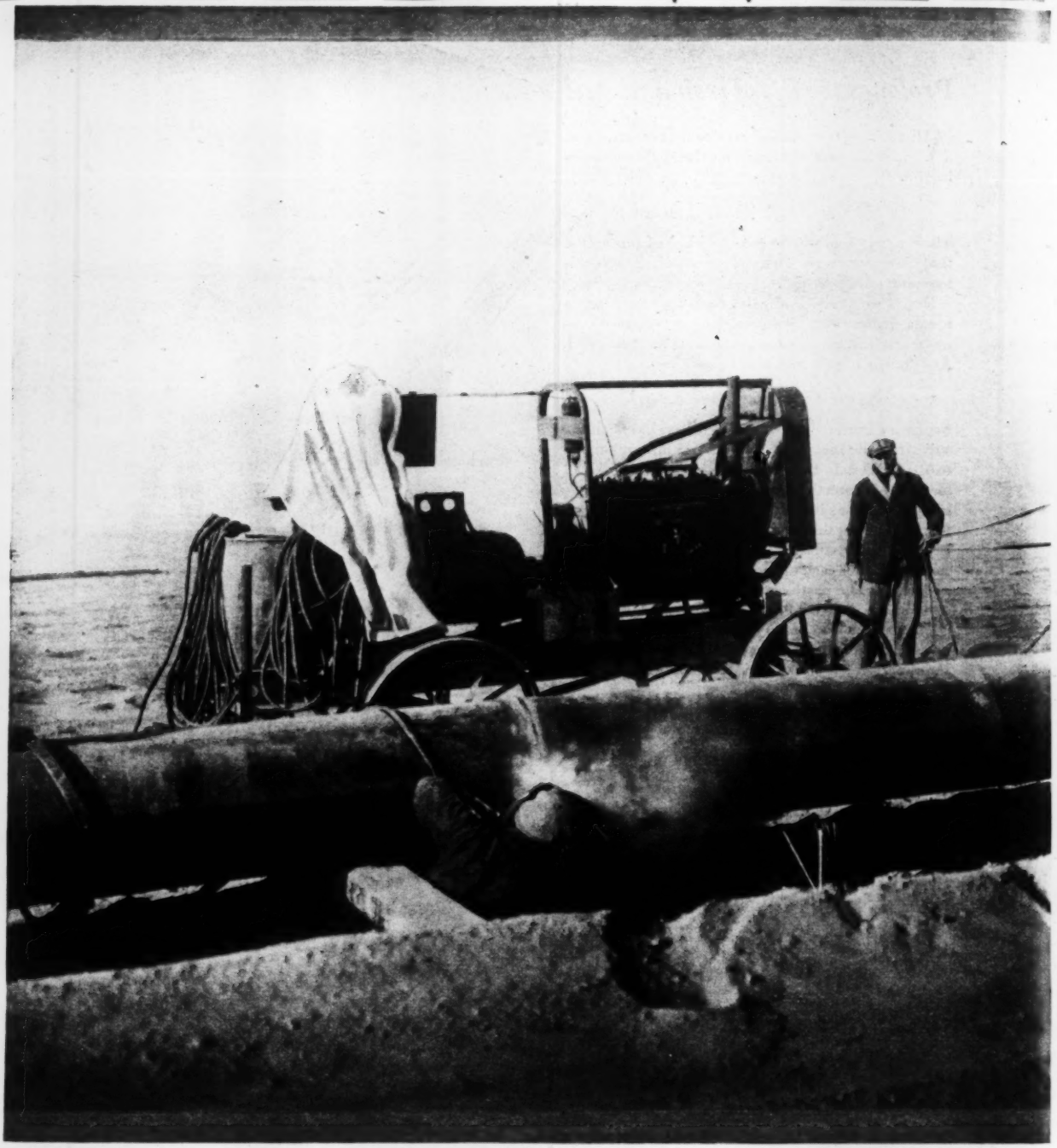
For over a hundred years, pure red lead has been the standard paint for iron and steel. Pure, fine and highly oxidized, Dutch Boy Red Lead offers a measure of protection that no other pigment can give. Comes in two forms—paste and liquid. The liquid (ready for the brush) is supplied in six colors... the natural orange-red, two shades each of green and brown... and black. The paste comes in orange-red, and can be shaded to dark colors.

For information on any special painting problem, write our Department of Technical Paint Service, in care of our nearest branch.

DUTCH BOY
RED LEAD

NATIONAL LEAD COMPANY
New York, 111 Broadway; Buffalo, 116 Oak St.; Chicago, 900 West 18th St., Cincinnati, 659 Freeman Ave.; Cleveland, 820 West Superior Ave.; St. Louis, 722 Chestnut St.; San Francisco, 2240 24th St., Boston, National-Boston Lead Co., 800 Albany St., Pittsburgh, National Lead & Oil Co. of Pa., 316 Fourth Ave.; Philadelphia, John T. Lewis & Bros. Co., Widener Building.

FIELD WEL



A bell hole welder tying in a 400-foot **SMITHWelded** *24" Pipe with* **SMITHWelding**

SMITH *WELDED*

DING

Across California, ten welders welded 40-foot lengths of 24″ pipe into 400-foot lengths and these 400-foot lengths into 4000-foot lengths, at a sustained average of 4700 feet per day.

A. O. SMITH CORPORATION

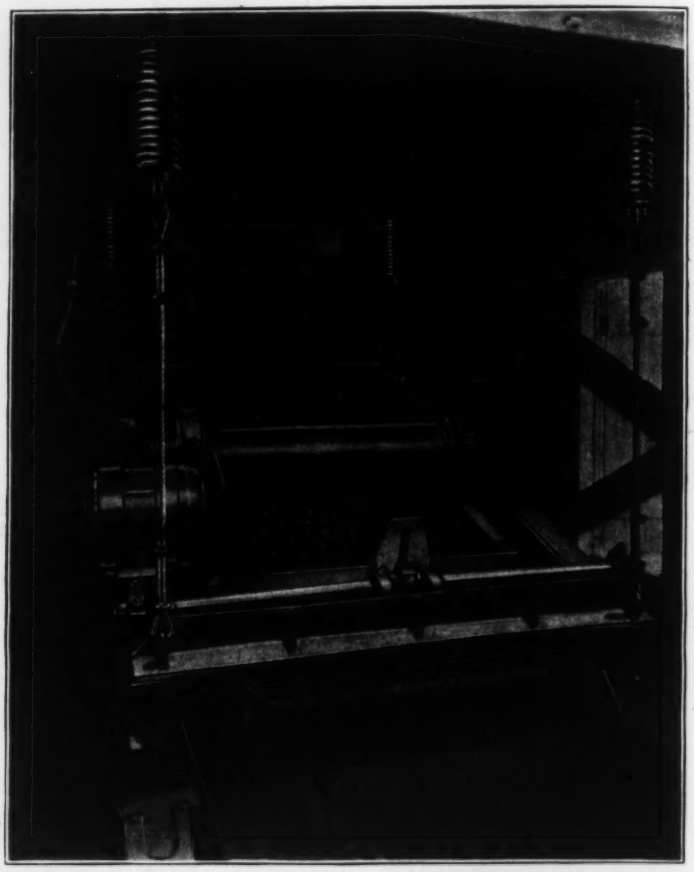
General Offices: Milwaukee, Wisconsin

OIL AND GAS FIELD PRODUCTS DIVISION

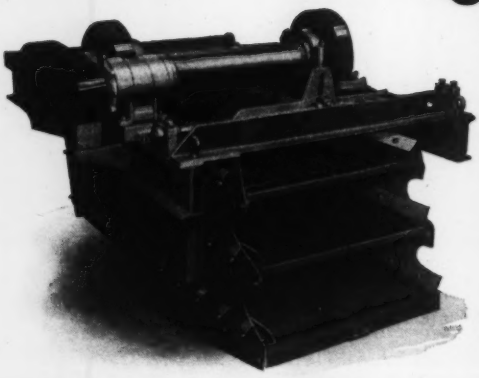
District Offices:

New York · Tulsa · Houston · Los Angeles

GAS LINE PIPE



Positive Mechanically Produced Motion—equal over entire screen surface



Allis-Chalmers vibrating screens are built with one, two and three decks in sizes 3′ x 6′ and 4′ x 8′ to suit conditions of operation.

. . . . The result, large capacity and a clean product. Allis-Chalmers Vibrating Screens have self-aligning, anti-friction bearings with positive dust seals, alemite lubricated; large eccentric shafts; and all rotating parts fitted with safety guards. The vibrating mechanism can be removed without disturbing the screen body or supporting frame. Screen sections are easily changed and are reversible, end for end. They are also interchangeable. The screening angle is adjustable. Centrifugal Vibrating Screens are built with single, double or triple decks. The liberal clearance between decks facilitates spouting and the changing of screen surfaces. . . . Details of construction and other data on vibrating screens are given in Bulletin 1470-A. May we send you a copy?

ALLIS-CHALMERS

Allis-Chalmers Manufacturing Company, Milwaukee

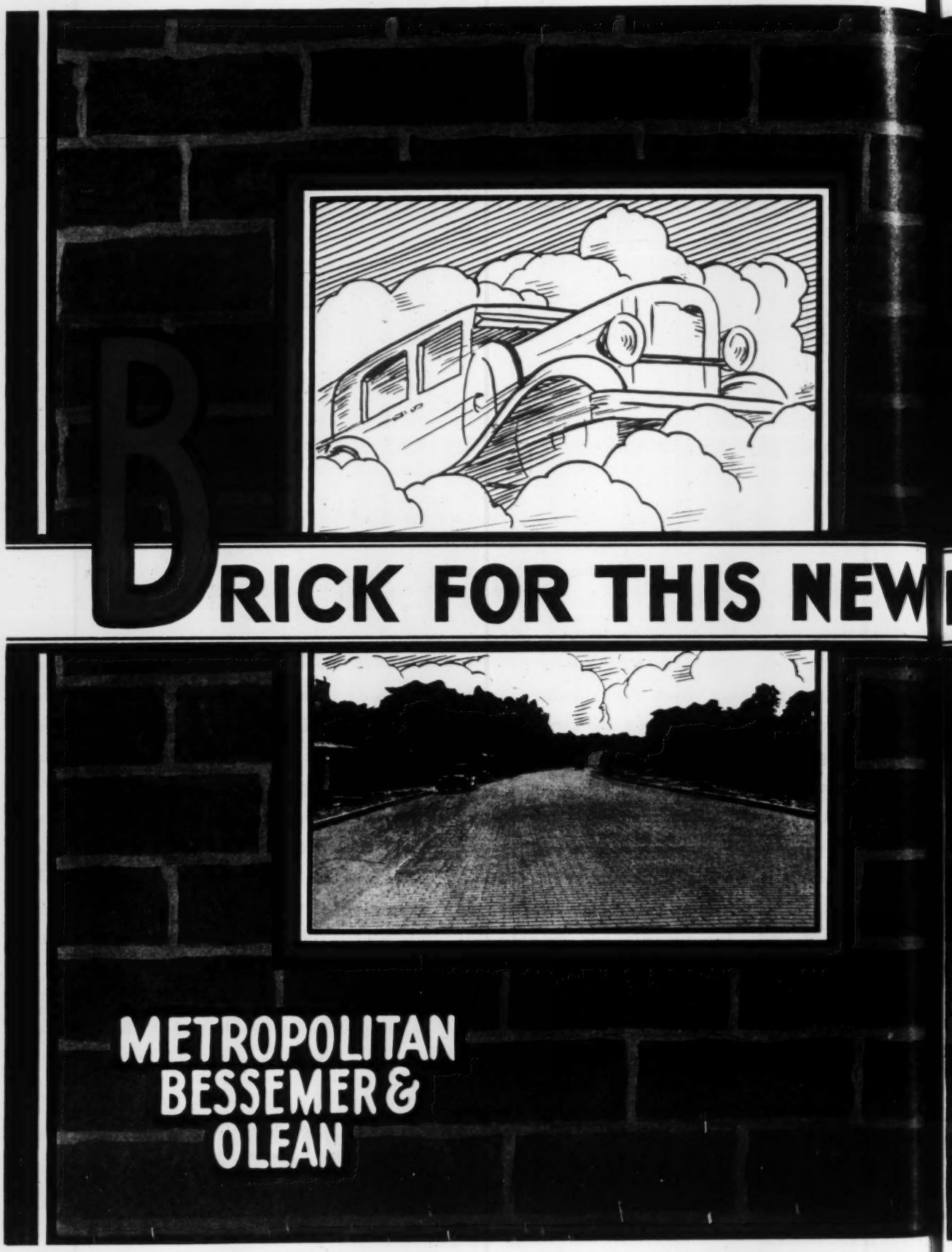
better valves for filter service

THE filter valve as a rule is operated as many times in one day as the distribution line or pumping station valve is in a year. Consequently the operating mechanism, seats and discs of the filter valve are subjected to many times the amount of wear encountered in other types of service. The moving parts are affected to a much greater degree by corrosion or oxidation since each operation of the valve removes the corrosive coating from the surfaces of these parts and thus prepares them for a renewal of the coating.

You no doubt have experienced the difficulty and expense that such operating conditions entail and you will readily appreciate the actual dollars and cents economy of a filter valve built especially to meet these operating conditions. The new Michigan filter valve has been developed specifically to fill that need. It incorporates the greater strength, density and corrosion resistance of Meehanite Processed Iron. It permits greater allowable working pressures without any increase in the face-to-face dimension of the valve. It embodies a scientifically designed operating mechanism that greatly increases its dependability.

Before closing your specifications for that filter plant, get the facts on just what can be saved by the use of this improved valve.

MICHIGAN VALVE & FOUNDRY CO. DETROIT


BRICK FOR THIS NEW
METROPOLITAN
BESSEMER &
OLEAN

HIGH SPEED BOULEVARD

The new high speed Ohio Boulevard which follows the Ohio River into Pittsburgh is surfaced with Vitrified Paving Brick.

Safety—freedom from glare—smoothness and long life are all features of Brick pavement that have been considered in building this new boulevard.

Metropolitan Bessemer and Olean are familiar brands to the public officials in towns and cities of the North Central district.

These three brands offer you the resources of the world's largest producers of paving brick—the advantages of a central location for shipping—and a quality product proved in actual service.

It will be to your advantage to specify Metropolitan, Bessemer or Olean for your next city street job, public highway or high speed boulevard.

THE METROPOLITAN PAVING BRICK CO.
CANTON, OHIO

. . Fortresses of Strength . .

An interesting installation of piling was that of the Dead Man's Island Dam on the Ohio River. The Dravo Contracting Company used the filled cellular cofferdam type of construction. Each cell was 40′ in diameter and tied by two short connecting walls to the adjoining cell. No bracing was necessary, the cells standing of their own weight. 3090 tons of Carnegie Steel Sheet Piling, section M 107, was used. This, a straight web section, was chosen because it is particularly adaptable to cellular construction where loads are applied inside of the wall and where interlocks are in tension.

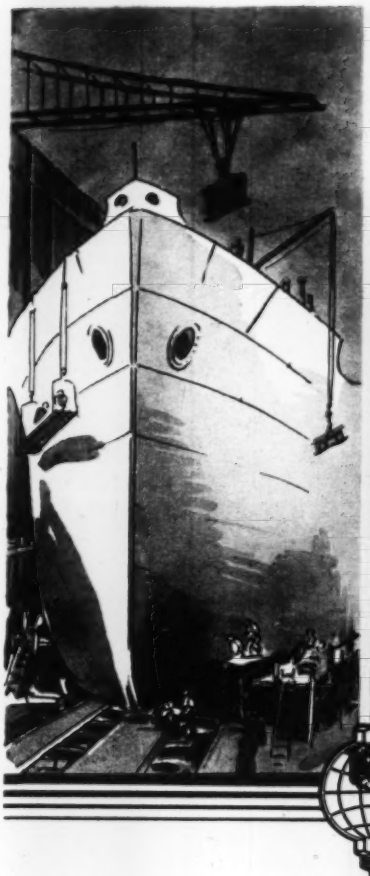
Carnegie Steel Sheet Piling is rolled in an efficient range of weights and sizes, including both straight and arch web sections, to cover every possible condition requiring the use of piling. An interlock of particularly rugged construction, ease of driving with no tendency to wedge or creep out of plumb and exceptional watertightness characterize Carnegie Piling Sections.

Engaged in the promotion of steel sheet piling for many years, we have been enabled to collect a vast amount of data as to the successful accomplishment of engineering works involving its use. Our engineering department is at your service.

CARNEGIE
STEEL SHEET PILING

105

CARNEGIE STEEL COMPANY · PITTSBURGH · PA. Subsidiary of UNITED STATES STEEL CORPORATION



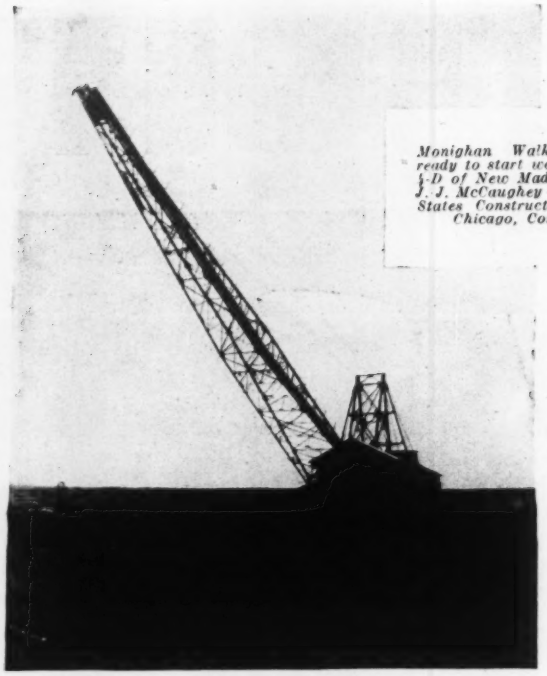
TIGHT

ASK any experienced steel construction workman his opinion about Pittsburgh Bolts, Nuts and Rivets and he will tell you "*They Tighten Up Tight!*". Which is a strong but expressive way of describing how strong, deep and perfectly threaded are all the threaded products of the Pittsburgh Screw and Bolt Corporation.

That is one reason why our products are used and preferred on so many important engineering projects throughout the country. Engineers have learned by experience that in our four great plants we can produce upon immediate notice, any size or shape of forged rods, bolts, nuts or rivets used in industrial or construction projects.

If you appreciate promptness, quick service and reliability you will appreciate our service.

PITTSBURGH SCREW AND BOLT CORP.
PITTSBURGH
Gary Screw & Bolt Company · · Chicago



Monighan Walking Dragline ready to start work on Section 4-D of New Madrid Floodway. J. J. McCaughey Company, and States Construction Company, Chicago, Contractors

And Still Another Monighan on the Mississippi!

This Monighan Walking Dragline has just been erected and is ready to go into action on the New Madrid floodway job, near East Prairie, Mo.

This machine is a 6-W Walker, one of the larger models. It has a 135 ft. boom, with 5 yd. bucket, and weighs 275 tons.

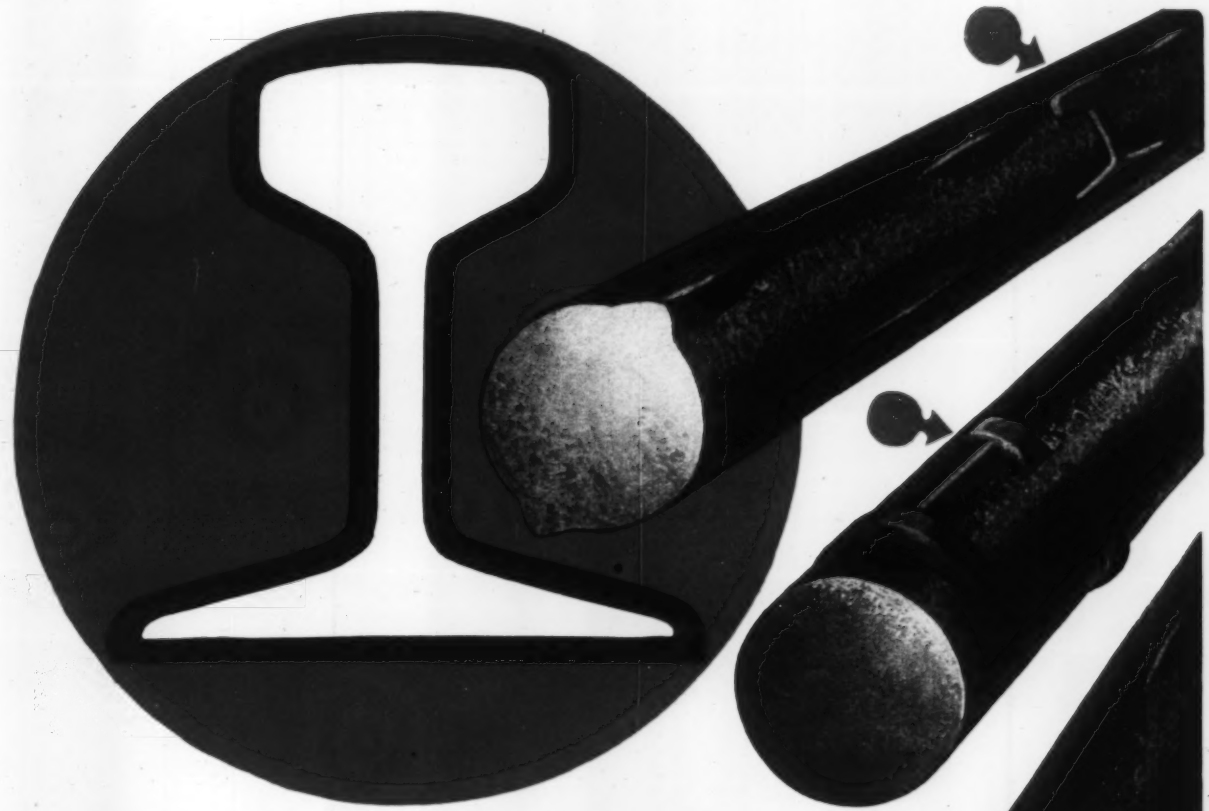
In spite of its great size and weight this machine works and moves as easily and as fast as smaller Walkers. It can step off in any direction, from any position, on any kind of ground except that actually under water. This means that it can be maneuvered into position rapidly regardless of local conditions and obstructions. A Walker can step off directly across, or at any angle with the line of work, as easily as it parallels or follows it.

This ability to keep in the most advantageous position for continuous operation means a lot in the way of time saved, lower labor cost, greater speed, and economical operation. It pays to use Walkers.

MONIGHAN MANUFACTURING CORP.

945 N. Kilpatrick Ave. **Chicago, Illinois**

MONIGHAN



MARKED

AND CERTIFIED. Standard quality (ASTM specification A 16-14) and positive source identification is assured by the association mark ● rolled on rail steel bars by

Buffalo Steel Company . . Tonawanda, N. Y.
Calumet Steel Company . . . . Chicago, Ill
Connors Steel Company . . Birmingham, Ala.
Franklin Steel Works . . . . . Franklin, Pa.
Laclede Steel Company . . . St. Louis, Mo.
Missouri Rolling Mill Corporation, St. Louis, Mo.
Pollak Steel Company . . . . Cincinnati, Ohio
West Virginia Rail Company, Huntington, W. Va.

Mills in Canada:

Burlington Steel Company . Hamilton, Canada
Canadian Tube and Steel Products Ltd., Montreal

● *For further information write*

Rail Steel Bar Association, Builders Bldg., Chicago

RAIL STEEL

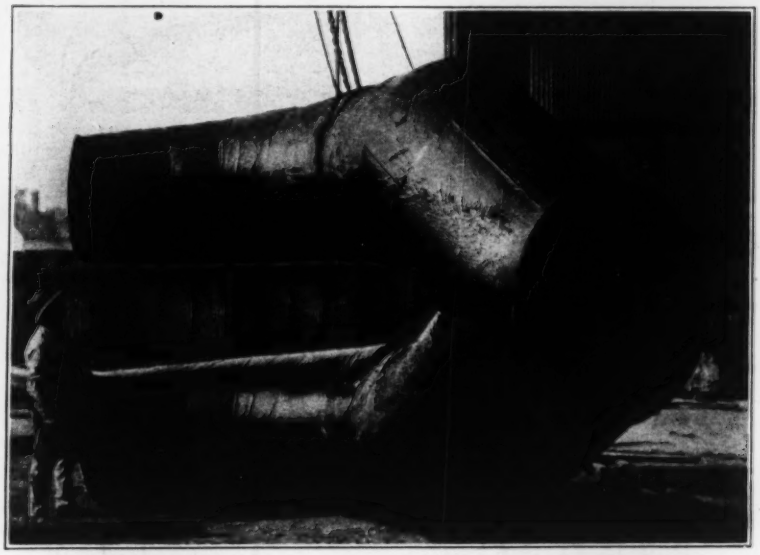
for concrete reinforcing

ARMCO INGOT IRON

can be depended on to *endure* ...and *save*

WHEN you choose Armco INGOT IRON for plate and sheet construction — tanks, towers, pipe lines, roofing and siding,—you can rely on long-time, trouble-free performance. More than two decades of diversified usage have tested this durable iron and found it worthy. This period represents the longest record of *actual service* of any low-cost, rust-resisting plates and sheets.

Besides rust-resistance, there are other important qualities that make Armco INGOT IRON a good investment. Consistent uniformity, ductility, workability and weldability all contribute to sound and economical construction. And these are *plus-values* that cost you nothing extra.



This large reducer joint called into play nearly all the qualities of Armco INGOT IRON: workability, weldability, uniformity and rust-resistance. It was fabricated from pure iron plates and welded with Page-Armco welding wire. Its owners—The Champion Coated Paper Company, of Hamilton, Ohio—were well pleased with the installation.

Armco INGOT IRON plates and sheets are available in all standard sizes, thicknesses and gages, thus offering you a material for your every requirement. Initial cost is moderate, even when compared with ordinary metals; while deliveries are dependable and prompt. Communicate with the office nearest you for complete information on the particular application you have in mind.

TUNE IN—The Famous Armco Concert Band broadcasts every Thursday Night WLW—700K. Cincinnati. Nine to nine-thirty E. S. T.

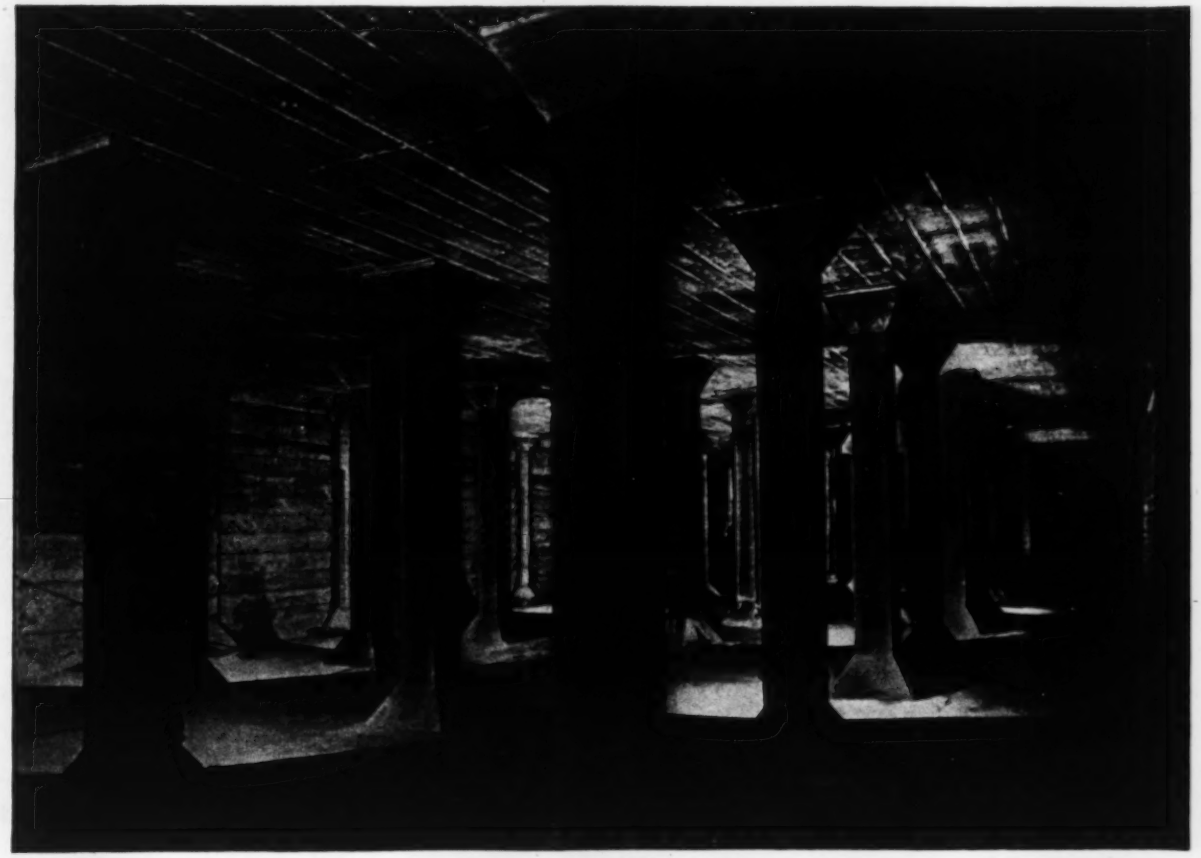
Back of this familiar symbol is nearly thirty years' experience in the manufacture of special analysis iron and steel sheets and plates. When you want a rust-resisting, low-cost metal be sure to see this triangle and the words, "Armco INGOT IRON." It is your assurance of dependable, economical service.

THE AMERICAN ROLLING MILL COMPANY
Executive Offices, Middletown, Ohio
Export: The ARMCO International Corporation

DISTRICT OFFICES: Chicago, Cincinnati, Cleveland, Detroit, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco

"BE SURE IT'S MADE OF ARMCO INGOT IRON"

INERTOL



British Water Works, Tientsin, China

Tight as a drum! This concrete drinking water Reservoir was painted with INERTOL from top to bottom—inside and out.

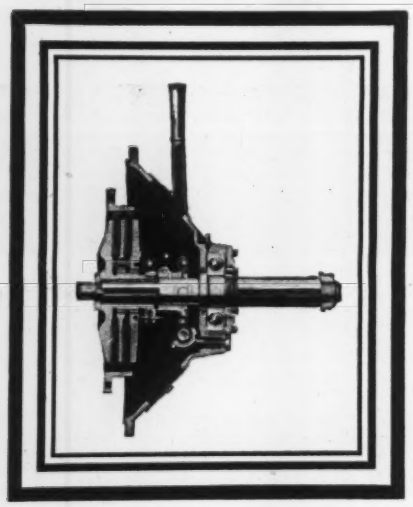
The benefits: No Disintegration—No Leakage—No Scum—Cleaned more Easily. INERTOL waterproofs and protects concrete and steel and has been doing it for over 25 years.

Write for the facts.

INERTOL COMPANY, INC.

253 BROADWAY **NEW YORK CITY**

BROWN-LIPE GEAR



WHEN a clutch design can claim ancestry in many of the earliest automobiles built . . . . . when it can prove that it has kept abreast and ahead of the needs of automobiles . . . . . it is small wonder that builders of heavy construction machinery select that clutch . . . . . That's the history of Brown-Lipe Clutches and Transmissions. . . . . Since 1904 Brown-Lipe has built clutches for automotive and industrial needs. . . . . No other manufacturer can equal that record. . . . .

An interesting folder on industrial clutches is yours for the asking. Consult with us on your clutch problems.

BROWN-LIPE GEAR CO.

There is no stronger mark of quality in your equipment, no greater assurance of trouble-free operation than Brown-Lipe.

ASSOCIATED Spicer COMPANIES

BROWN-LIPE
CLUTCHES and
TRANSMISSIONS
BROWN-LIPE GEAR CO.
SYRACUSE, NEW YORK

SALISBURY
FRONT and REAR
AXLES

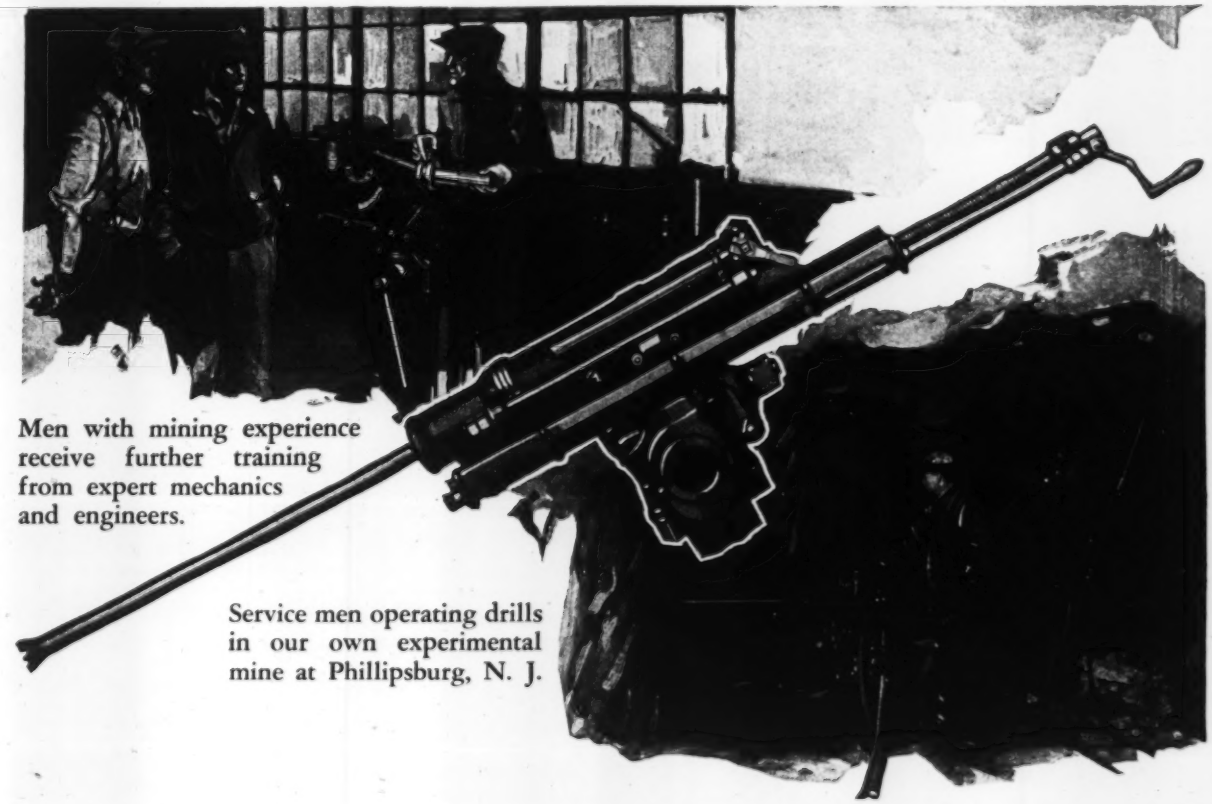
SPICER
UNIVERSAL
JOINTS

SPICER MFG. CORP., TOLEDO, OHIO

PARISH
FRAMES and
STAMPINGS
PARISH PRESSED STEEL
CO., READING, PENNA.

TRAINED SERVICE MEN

Behind every I-R DRILL



Men with mining experience receive further training from expert mechanics and engineers.

Service men operating drills in our own experimental mine at Phillipsburg, N. J.

We not only sell rock drills, but we service them . . . The closing of a sale of an I-R drill is only the beginning of our responsibility . . . You are entitled to this service for the entire life of the machine . . . We maintain service departments in every country of the world for your convenience . . . Such departments are manned by experienced rock drill men who receive special training in our own shop and experimental mine . . . Think what this service behind a drill really means to you.

INGERSOLL-RAND COMPANY - 11 Broadway - New York City

Branches or distributors in principal cities the world over

For Canada Refer—Canadian Ingersoll-Rand Co., Limited, 10 Phillips Square, Montreal, Quebec

184-LI

Ingersoll-Rand

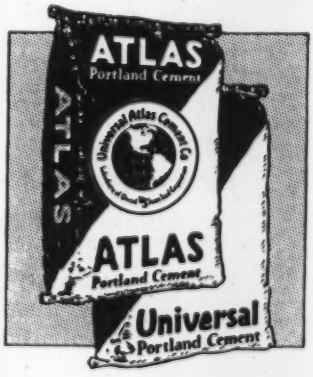
Beautiful Wacker Drive, Chicago, built in 1926 at a cost of $22,000,000. Concrete made with Universal Atlas cement was used for the reinforced concrete in the superstructure and for pavement bases. Concrete designed by Arthur R. Lord, consulting engineer, Chicago.

Section of concrete demolished for new bridge

4-year tests prove high quality of this *Universal Atlas* concrete

In building a new bascule bridge this year, it was necessary for the city of Chicago to demolish a section of Wacker Drive, a double-decked street. The reinforced concrete in this structure, which was built in 1926, was designed in accordance with approved modern methods and built with Universal Atlas cement. The average compressive strength of five sawed cubes taken from the demolished superstructure was 11,400 lb. per sq. in. A sawed cube from the paving base showed a compressive strength of 10,200 lb. per sq. in. Compared with this, the 4-year compressive strength of concrete made by methods in common use at that time for structural and pavement concrete averages between 3000 and 4000 lb. per sq. in.

Results secured with Universal Atlas standard portland cements on both quality concrete for regular work and on high-early-strength concrete for rush jobs are shown in the booklet "High-Early-Strength Concrete"; copy will be furnished on request.



71

CHICAGO
NEW YORK
NEWARK
PHILADELPHIA
BOSTON
ALBANY
PITTSBURGH
CLEVELAND
COLUMBUS

Universal Atlas Cement Co.

Subsidiary of United States Steel Corporation

Concrete for Permanence

MINNEAPOLIS
DULUTH
ST LOUIS
KANSAS CITY
DES MOINES
OMAHA
OKLAHOMA CITY
BIRMINGHAM
WACO

ENGINEERING NEWS-RECORD

A McGRAW-HILL PUBLICATION — ESTABLISHED 1874

DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

F. E. SCHMITT, *Editor*

Volume 105 NEW YORK, DECEMBER 25, 1930 Number 26

Hail to the New Year!

THE holiday season, with its time-mellowed wish of "peace on earth, good will to men" and its ever-hopeful promise of better things to come with the new year, once again is upon us. To a greater degree than usual it comes as a grateful interlude after twelve nerve-wearing months of business depression. But the very fact that unemployment and misery are unusually prevalent has acted as a remarkable spur to relief efforts, and has intensified the spirit of universal brotherhood which too often becomes submerged in the rush of every-day affairs. Belief that conditions will improve with the new year is widespread. Fortunately this is more than an optimistic hope; there are many indications that the depression has nearly run its course. Because, in the last analysis, business conditions are determined by the cumulative thoughts and actions of the people as a whole, the attitude of confident hope in the new year is wholesome. May this present Christmas mark the end of a bad year, and the coming New Years Day the beginning of a better one.

Practical Gifts

AS THOUGH to offer the nation a better year-end holiday, the past week brought two highly practical gifts to a depressed business world, a $116,000,000 emergency public-works appropriation, and a call for construction bids on the Boulder Canyon project six months ahead of the intended time. Congress in making the appropriation and the Interior Department in speeding the bidding took helpful steps in the direction of counterbalancing the discouragement of decreased private construction and business by increased public construction. The initiation of the works in question is important less because it involves two hundred-odd million of expenditure than because it will bring about a saner and more confident outlook on the immediate future. As unemployment relief measures they are not likely to have a direct effect, for road construction goes on mainly in summer, while work on the Hoover Dam will not be active for at least three months, when the contract is awarded. But both roads and dam call for extensive advance work in providing tools and supplies, especially Hoover Dam, whose construction problems are so formidable as to require many industries to begin careful preparation at once. This indirect effect should produce an early gain in employment. But even regardless of this effect, the two events constitute an encouraging expression of the country's faith in its own strength and of its willingness to enter into large investments for the purpose of equipping its household more efficiently. Road construction will spread its benefits all over the country. Hoover Dam brings to reality the long vision of building a greater future for the Southwest, and thereby calls into immediate action the creative forces which must shape this future in detail. All told, the joint influence of the emergency work and the Hoover Dam contract promises to be large, and in consequence business can enter the new year with fresh energy and courage.

One Difficulty Overcome

OF THE ninety millions for roads appropriated by the emergency bill, only ten millions is intended as actual federal expenditure, while eighty millions is merely a loan to the states, which they must repay within seven years. For a long time past many of the states have not found it easy to contribute road money equal to the federal allocation, as required by the federal-aid law, and the task became no easier when, last spring, Congress added fifty millions to the prior seventy-five millions of federal-aid money for the current fiscal year. The present loan of eighty millions overcomes the difficulty and puts the states in position to carry on active road work throughout the 1931 season—by a special provision the fund will not expire until September, two months after the end of the fiscal year. The major obstacle to effective use of road construction for unemployment relief being thus removed, it is now the task of the states to deal with the next obstacle, that of seasonal operation. As we argued last week, quick action by the state highway authorities can get a great deal of work under way even now, extending through the winter. To this end it is necessary to complete project plans at once and let contracts, so that the contractor is free to do all the winter work practicable. If in addition the authorities would offer a premium for early completion and thereby encourage work through the winter, they would contribute usefully to the fight against unemployment.

A Water-Power Policy

WITH a new Federal Power Commission at last in office, a definite and continuing national water-power policy now appears assured, for the first time since the water-power act was written. Heretofore the act has been administered by a commission composed of three members of the President's cabinet, the theory being that as heads of the three federal departments most concerned with the rivers of the country these secretaries would bring to the administration of the act the broadest possible views of the country's needs and requirements. Actual practice did not bear out the theory. The secretaries were too busy with other matters, and the real work therefore devolved on one man, the executive secretary of the commission. Too much responsibility was placed in his hands, and too much detail work to permit any long-range study and planning on his part. To correct this condition and to relieve the three secretaries, Congress early this year amended the law to make the power commission a body composed of five men appointed by the President for that sole purpose, and late last week the Senate confirmed the

appointees. Able men have been selceted. They will be free to study their problem and formulate policies. Many matters have been greatly in need of such study for a long time, but now for the first time they are to receive it. A welcome change in the handling of federal water-power matters is in prospect, and in time we may expect a true national policy to be formulated.

Too Rough a Road

IF WE are to have wise and effective action through regulatory or administrative boards and commissions, these public bodies must be made up of men of ability. When the appointees to such service are compelled to travel as rough a road as were the new members of the Federal Water Power Commission in their recent examination by the Senate prior to confirmation, a serious discouragement is set up. The Senate's cross-examination was harsh and offensive. It did not confine itself to their ability as students of power and their integrity as men, but sought to indict them of unfitness or ulterior motive on the score of being acquainted with private utility men or of believing that private utility operation is efficient. It seemed as though the Senate sought to place on the commission only men committed to public utility operation and hostile to private operation. Yet it is clear that if such a law as the federal water-power law is to be administered fairly and for the purpose which it is intended to serve, the commission should not be made up of men representing one side alone. Such action as that of the Senate threatens the very fundamentals of effective commission control. Men of high quality are likely to decline appointment when the path to office leads over a needlessly rough road.

A Revetment Problem

THE ingeniously mechanized process of concrete bank revetment which is described in this issue commands admiration for the invention displayed. Yet it suggests some further thought. Here is a plant of staggering proportions and cost, provided to build, at a cost of more than a quarter million dollars a mile, scour-protective armor for a ribbon of river bank scarcely more than 400 ft. wide. That the structure produced is reasonably successful in its task may be granted, but it fails on occasion and nearly always requires a watchful campaign of repair and reinforcement. In the light of cost and service, considering both in their most favorable aspects, the question arises whether revetment as it is conducted on the Mississippi River does not warrant searching inquiry for a substitute structure. It is true that successive engineering generations along the river have gone afield for other devices and have invariably come back to the continuous bank mattress as the best defense that experience offers against scour and caving. But it is also true that these explorers were not supported with means and encouragement which gave promise of discovery. An improved situation exists today. The new laboratory of river hydraulics provides means for fundamental research. Experimentation with buried groins is being inaugurated. More encouraging than either is the aroused consciousness of the directing heads of the river work that the enormous cost of present methods is a challenge to the wisdom of their guardianship. With this new encouragement there may be hope of success where failure has always greeted prior efforts to escape the costly burden of revetment construction.

Hoover Dam

HERETOFORE the Boulder Canyon dam, or Hoover Dam, to use the name given it by prenatal christening, has been thought of as excelling chiefly in size. Even the description given in our pages last February seemed to convey little more. Now the bidding plans and specifications reveal it as the most advanced, the boldest and most thoroughly studied hydraulic enterprise in engineering history.

That it proved possible through special effort to put the call for bids ahead six months, and thereby help to bring earlier relief to our lagging productive activities, entitles the engineers and officials of the Reclamation Bureau to thanks and congratulations. But they deserve even greater commendation for the quality of their work. The plans and specifications are of rare perfection. Not only are the arrangement and details of the structure worked out with high originality and painstaking care but the specification of desired results approaches measurably near to that ideal at which the engineer's arbitrary judgment is eliminated. Such preparation goes far toward assuring successful and satisfactory construction.

Hoover Dam is to be nearly twice as high as any dam yet built. But this single fact gives only a fragmentary view of the dimensions of the tasks involved. With five million cubic yards of concrete, thirty thousand tons of structural steel and over seventy miles of grouting holes, with rock tunnels ranging from fifty to seventy feet in diameter and two thousand tons of needle valves, the structure that is to be set in the path of the turbulent Colorado in a sheer-walled narrow gorge at the bottom of an inaccessible desert canyon, in the remotest region of the United States, constitutes a work ranking with the greatest ever attempted by human hands. Size and remoteness aside, however, the project gave rise to broader and more fundamental study of the strength and action of dams than engineering science until now has known. It will doubtless become a new datum point in the record of dam and hydraulic construction.

Two years ago a review board of engineers and geologists answered various doubts about the safety of the projected dam by indorsing the general scheme, with a conservative recommendation as to foundation loads—thirty in place of forty tons per square foot. The same board was then charged with the responsibility of approving the final design before construction. It has done so, and only details remain to be considered, certain construction features of the dam and the discharge works. As now presented to bidders the project is substantially final, and no engineering problems stand in the way of early beginning of work or its successful prosecution through the seven years of construction.

Very recently it had been feared that difficulties would arise in the contractual relations between the bidder and the government because of the size of the work, the risk of loss by floods and the possibility of unforeseeable changes in labor and material costs during the long time involved. Some people believed that the contractor would need to be protected by a special contract to relieve him of undue risk, while others asked that local labor be given a preference, that a prevailing-wage requirement be included, and the like. In short, the contractual relation appeared to be a serious problem. It is highly fortunate, we believe, that a simple and normal contract is now proposed to bidders. Only three unusual clauses appear: (1) the bid bond and the construction surety are set at fixed and moderate amounts (two million and

five million respectively); (2) the government, after once accepting the cofferdams built to its design, assumes the risk of flood damage to all property except contractor's plant; (3) veterans and citizens have a preference right to employment. These provisions give such protection as is needed and are not likely to cause delay or to limit the contractor's freedom in his effort to get efficient and economical results. It may be noted also that the government will supply all main materials, except concrete aggregates, but this is not without precedent and should not bear on satisfactoory construction relations.

Of the structures of the project, the great dam itself commands interest far overshadowing that of the accessories. It was early recognized as presenting a critical problem in respect to determining the stress action, especially because the arched form (suited to the gorge location and the hard rock walls) made it inevitable that much load would be borne laterally by arch action. Intensive study was therefore given to mathematical analysis of the structure in order to determine the precise nature of the interaction between the horizontal arch elements and the vertical beam elements of the dam. As a result, a high degree of certainty has been attained in determining how the dam will resist water pressure. Model tests are to be made in confirmation, but perhaps after all a model three or four feet high will not be able to bring out as much truth as does the mathematical study. The dead-load stresses and those stresses which exist in the unloaded mass are of course unknown; the construction methods are planned to set limits to these stresses so far as possible.

A more critical question was that of building the dam so as to obtain an integral mass and avoid cracking—which outside of foundation uncertainties is the most serious defect in modern concrete dam construction. Both shrinkage due to moisture change and thermal action due to heating of the concrete while it is setting and to subsequent cooling and contraction are factors here. Shrinkage is dealt with in Hoover Dam by building the structure in blocks or vertical columnar prisms fifty feet square, the joints between which are to be grouted under pressure later on, thereby creating a solid arch. The heating difficulty is dealt with by placing within the concrete a close network of cooling pipes, through which refrigerated water is to be circulated during the setting of the concrete to keep it cool and draw out the heat generated by the chemical action of set. The ideas embodied in these two expedients are closely in harmony with those entertained by leading workers in the field of dams for some time past, but they have never been translated so definitely into practical form. Block construction has been adopted in many dams ever since Schussler's Crystal Springs dam of forty or more years ago; but as now used, with bitumen-painted sides fully keyed, and subsequent grouting, it is unmistakably a new departure. Far more radical an innovation, however, is the cooling-pipe system, an expedient which perhaps is due in part to the hot summer climate at the site. Its virtues are untried, but on the other hand it cannot harm the dam. It is preeminently the most original feature of the dam.

Dry mixtures are to be used in all the concrete work, to obtain high strength and density, and accordingly bucket placing is specified. But it is timely to remark here that many questions relating to the concrete work are still to be considered in detail. A special committee of concrete experts outside the Reclamation Bureau has been appointed for this purpose; its sessions early in January are expected to place the questions of cement and concrete on a final basis. They will contribute to making Hoover Dam a significant milestone in the progress of dam science and construction.

In view of these remarkable studies and design developments, the exceptional site, the deep foundation work and the thorough grouting of the foundation rock that is proposed, the magnitude and complexity of the associated structures, it is in no way extravagant to conclude that the Boulder Canyon project has been given an engineering stature fully proportionate to its position as a surpassing contribution to the development of the Southwest, and indeed its security. Full appraisal of the service that the control of the Colorado will render to that region must be left to the future, but at the most moderate estimate the service constitutes a challenge to the engineering profession that it support the project with the highest performance within its power. The engineers responsible for the project have done their part.

Chicago Tax Troubles Again

ONCE more Chicago and Cook County face the specter of what to a corporation would be a receivership. With high assets and a moderate tax burden the city should find tax collection easy, but archaic methods of fixing the tax rates through several uncoordinated agencies have brought the city itself and numerous other spending bodies in the county almost to the point of despair because of slowness in collections.

A year ago a citizens' committee practically assumed receivership authority, by raising money on the security of tax anticipation warrants and then doling it out to the different appropriating bodies on a showing of necessity. Thereafter the 1928 taxes were collected and the tax warrants for that year redeemed. The 1929 and 1930 taxes have been levied, borrowed against and practically all spent, but they cannot be collected. The tax-collecting machinery was started, but it does not function.

First there came the not-too-cheerful information that 1929 bills are 20 per cent higher than those for 1928. Many thought that the latter were unconscionably high, and millions of dollars worth of property has been sold for taxes, with still more to follow when tax buyers can be found. Next, the board of review objected to the assessors' valuations and ordered a reduction of 10 to 50 per cent on land because of the deflated condition of real estate, the 1928 appraisals having been based on peak prices. The complexity of the problem is greatly accentuated by the fact that soon the budget makers for 1931 operations will be actively appropriating funds, and they can base their appropriations only on the last authenticated tax valuations, those for 1928.

Doubtless the bankers, to whom the city officials must ultimately look as a source of funds borrowed on tax anticipation warrants, are waiting with the glee of a modern Scrooge for the time when these same city officials shall come to them, hat in hand, to help them out of their troubles. "Six per cent with a fat commission" is likely to open the conversation. Not a nice reception to the fiscal agents of the second city in the land! But the disgraceful condition may ultimately result in legislation that will unify the many independent and overlapping taxing bodies and simplify the whole procedure. Often things must get very bad indeed before they begin to get better.

Articulated-Concrete Revetment Construction on the Mississippi River

Method of Casting Mat Sections of 25 Articulated Blocks, Assembling These Sections Into Articulated Mats 140 Ft. Wide and 250 to 300 Ft. Long and Sinking the Mats Flat on the Underwater Bank of the River

By Morris W. Gilland

First Lieutenant, Corps of Engineers; Area Engineer, Vicksburg Engineer District, Greenville, Miss.

Editor's Introductory Note

EARLY in the task of regulating the Mississippi River for navigation and flood protection, it was manifest that some of its banks must be prevented from caving. The means developed through the years were contraction works such as retards, dikes and wing dams, used largely in the upper river (above Cairo), and smooth revetment extending from the top of the bank to the bottom of the river, used largely in the lower river. There were many experiments in the beginning, but gradually brush mattress superseded all other types of revetment structure and remained supreme until 1915, when its position began to be contested by concrete.

Two types of brush mattress were evolved—the framed mattress (*Engineering News-Record*, May 1, 1930, p. 720), used below the Red River where the depths are 100 to 150 ft., and the fascine mattress (*Engineering News-Record*, July 3, 1930, p. 4), used above the Red River where the depths are 50 to 80 ft. In constructing revetment the brush mattress starts at the water edge and extends down the underwater slope to the river bottom. As the river is at extreme low water for only a short period, most revetment is constructed at some higher stage, and the shore edge of the mattress is left dry as the water level falls and is submerged again as the water rises. In the alternately wet and dry zone, the brush deteriorates rapidly. This has been the great weakness of brush-mattress revetment.

There were other defects. From the shore edge of the mat the upper bank, properly sloped to 1 on 3 or 1 on 4, was paved with riprap or concrete. A secure connection between the mattress and the upper bank paving was difficult. Also there was difficulty in getting materials. Willows for brush mattress grow on the islands and shore between the river and the levee. At the higher stages of the river the land is submerged or is left too soft for brush cutting and hauling. In recent years also, the willow brush has become exhausted by extensive cutting for revetment. Finally, as the wages of labor increased, brush-mattress construction, which is largely hand work, became much more expensive. These reasons prompted a search for substitutes.

Concrete was the first thought because it had served well for upper bank paving, was even more durable under water and suffered little from being alternately wet and dry. Also, cement and aggregates were available at any time, and the latter at low cost by dredging from bars in the river. The credit for the initiation of the studies and experiments that led to the present designs of the concrete mat rests with Col. E. M. Markham, Corps of Engineers, who, as district engineer at Memphis, made preliminary studies and recommendations which led to the authorization of certain experimental work in October, 1914, in that district. Following the initiation of experimental work in the Memphis district in 1914, the Vicksburg district began experiments in 1915, which led to the adoption of what is now known as the articulated type of revetment. Construction was begun with rather crude plant and product, which have since been improved to the very high perfection described in the article which follows.

Meanwhile, another type of concrete underwater mat was developed in the Memphis district. Its purpose was to secure an articulated unit heavier than the 1x4-ft.x3-in. blocks of the older Vicksburg type, which would be less likely to shift when in time the connecting cables would be destroyed by corrosion. The new mat type, known as the lapped-slab type, was worked out in 1925 by Col. G. M. Hoffman, Corps of Engineers, and in 1927 its active construction was begun.

At present lapped-slab concrete revetment is standard construction in the Memphis district, and articulated-mat concrete revetment is standard in the Vicksburg and the New Orleans River districts. Last year no brush-mattress revetment was constructed in the Vicksburg district, but it continued to be used in the other two districts. —Editor.

ARTICULATED-MAT concrete revetment construction consists of four operations: (1) fabricating the articulated-mat sections; (2) grading the upper bank to a 1 on 4 slope; (3) assembling and sinking the sections to make a continuous revetment; and (4) paving the sloped bank with concrete. The complete construction process of four operations is preferably a continuous undertaking, but there are occasions when it is permissible to delay the upper bank operations for a time after the underwater mat is completed. Each of the four operations requires a separate plant, and there is virtually a fifth plant unit in the fleet of tow boats and barges which provides interplant and intraplant transportation. In this article the fabricating, assembling and sinking operations and equipment are emphasized, and the bank grading and paving are more briefly described.

Revetment Structure

Articulated-mat revetment consists of a series of lapped mats extending from the water's edge to the bottom of the underwater bank and outshore on the river bottom some 50 ft. farther. Each mat, as indicated by Fig. 1, is 140 ft. wide alongshore (the length of the mat-laying barge) and from 300 to 350 ft. long outshore from

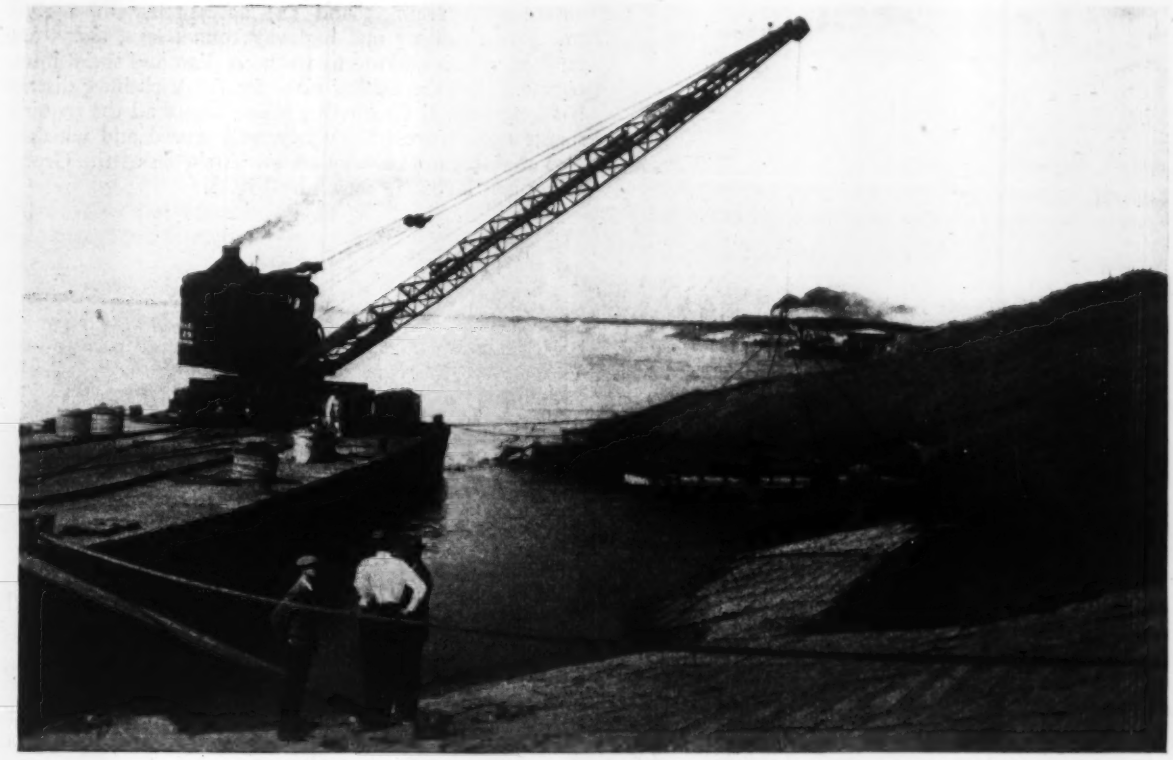


FIG. 1—LOCOMOTIVE-CRANE BARGE LAYING MAT SECTIONS ON UPPER BANK

the water's edge. Adjacent mats overlap 10 ft. Each mat is made up of mat sections (4x25 ft.) strung on steel cables, which extend upbank and are anchored inshore. The mat sections have their long sides normal to the shore. From the water's edge where the flexible mat ends, the upper bank is paved; the two most generally used forms of upper bank paving are: (1) mat sections laid by crane and (2) monolithic slabs of reinforced concrete.

The unit of articulated-mat revetment is the mat section consisting of 25 blocks (3 ft. 10 in. by 11 in. by 3 in.) cast on a single integral piece of reinforcing mesh of 4- and 7-gage wires spaced 12 in. each way. So cast, the blocks form a slab 4x25 ft. and 3 in. thick, articulated by the reinforcing mesh. This mesh is also spaced in such manner that, as shown by Fig. 4, the wires along the slab sides are exposed so that they may be clamped to the steel cables which thread the mat sections into a continuous revetment mat. In addition, two wires are cast into the end blocks, so that adjacent ends of mat sections can be connected by twisting the projecting wires together.

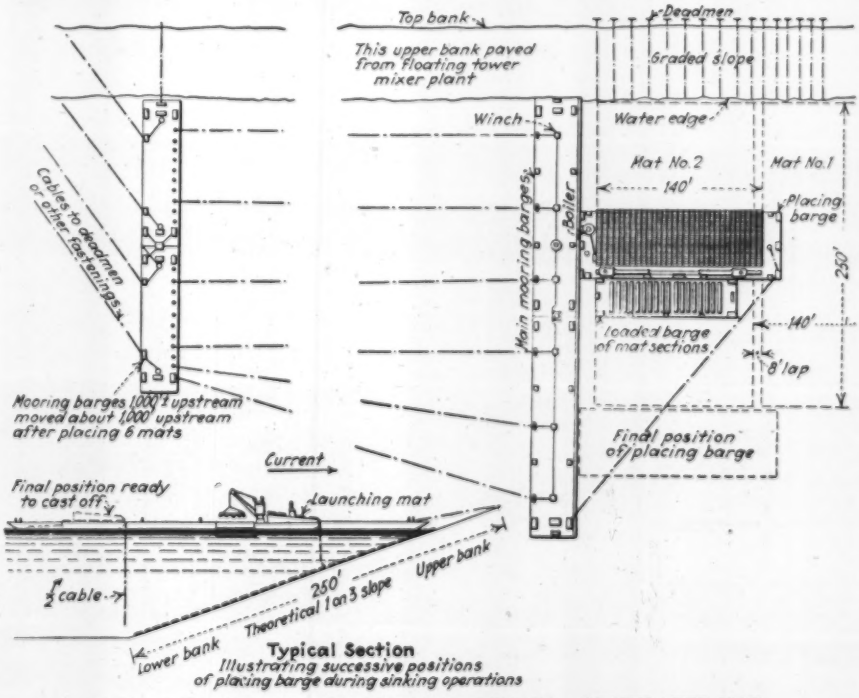


FIG. 2—PLANT ARRANGEMENT FOR SINKING ARTICULATED MAT CONCRETE REVETMENT

The cement for the mat sections is standard portland except that seven-day strength must be attained in four days. Sand and gravel are dredged from a river bar, screened on the dredge boat and loaded in separated bins on sand and gravel barges. The gravel grades down from 2 in. to ¼ in.; the sand is rather fine.

The plant for furnishing aggregate consists of a gravel digger and of six to eight sand and gravel barges, which are standard steel barges with a sand and a gravel box on each.

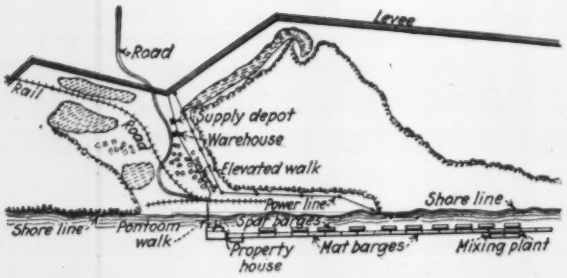


FIG. 3—SKETCH PLAN OF GREENVILLE PLANT FOR CASTING MAT SECTIONS

Each barge carries 200 cu.yd. of gravel and 100 cu.yd. of sand. The digger is a 12-in. suction dredge, which pumps the material over ¼-in. grizzly bar screens. These desand and dewater the gravel very completely. The screening and chuting arrangement is such that both sand and gravel are discharged at the same time onto the same barge. The digging plant is self-contained and has its own quarters and mess. It has a crew of fifteen, of which five are white engineers and dredge runners, and ten are negro oilers, deck hands, etc.

The reinforcement is of particular concern, as its function is to hold together first the mat blocks and then the mat sections; therefore, it has to resist corrosion by long immersion and also extreme flexure, as the mat takes rest on irregular bottom. A mild copper-bearing steel wire heavily galvanized is used, and all joints are bonded by a mechanical non-slipping wrap, since welding destroys the galvanized coating and leaves a weak spot for rust attack. The wires have an ultimate strength of 65,000 to 80,000 lb. per square inch. Little tolerance in mesh spacing is permissible, as the wires must fit exactly slots in the steel forms for the mat blocks. The mesh is shipped in 300-ft. rolls 4 ft. wide, which are cut into 25-ft. sections.

Craft paper is used to separate the mat sections, which are cast in tiers. This comes in 200-lb. rolls, is cut into 25-ft. lengths, and each length is rolled into a tube for easy handling. In case of wet weather two separating layers of paper are used instead of one; this is preferable to using two weights of paper.

The plant for casting mat sections is barge-mounted, except for a few minor shore units; it can be cast loose and towed to whatever location is most convenient to the majority of the contemplated revetment operations. Generally a location is sought which will serve for as long a time as is economical, considering: (*a*) favorable foreshore and current conditions; (*b*) distance of tow from gravel digger to casting plant and from casting plant to revetment operation; and (*c*) accessibility of a river town with railway and highway connections, shops and business places and means for recreation and social intercourse. Thus the casting plant for the Vicksburg district has long been at Greenville, Miss., where all the requirements named are particularly well served and which is also engineer area headquarters. A sketch of the Greenville plant layout is shown by Fig. 3.

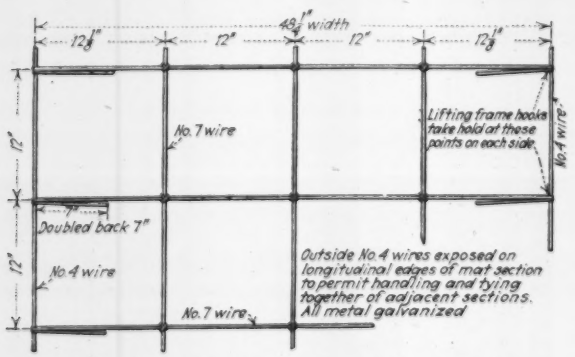

48½" width
12½"
12"
12"
12½"
12"
12"
No. 7 wire
Lifting frame hooks take hold at these points on each side
No. 4 wire
Doubled back 7"
No. 4 wire
No. 7 wire
Outside No. 4 wires exposed on longitudinal edges of mat section to permit handling and tying together of adjacent sections. All metal galvanized

FIG. 4—REINFORCEMENT FOR MAT SECTION OF 25 ARTICULATED SLABS

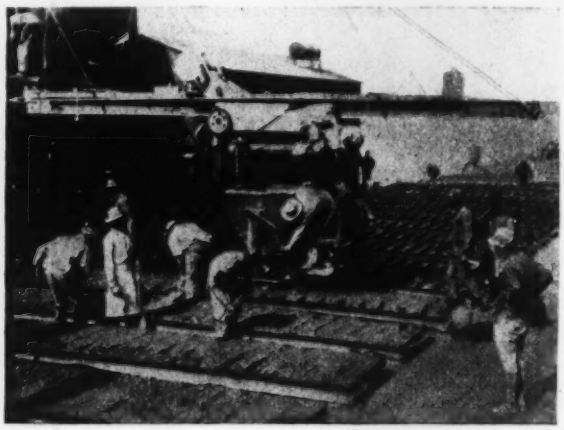


FIG. 5—CONCRETING STEEL FORMS FOR MAT SECTIONS

Notice the craft paper separating the sections being concreted from those previously concreted and the operator riding the bucket to control the discharge.

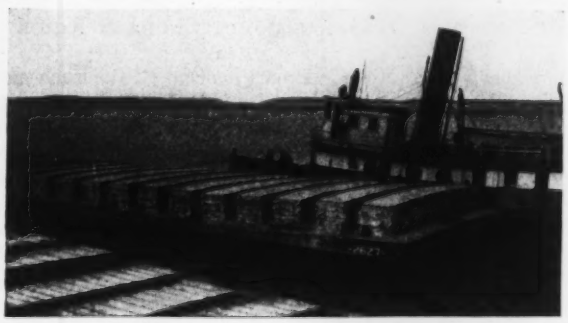


FIG. 6—BARGE LOADED WITH TIERS OF PRECAST MAT SECTIONS

A standard steel barge holds twenty tiers of fifteen mats each. Approximately 60 of these barges are required for a plant casting 800 mat sections in ten hours.

FIG. 7—CLOSE-UP VIEW OF ROLLER WAYS ON PLACING BARGE

The men are cleaning the rollers after a launch. The nearest rollers show an anchor cable lifted up into sight. Ordinarily, it lies down between the two sets of rollers.

Assuming one ten-hour shift and a production of 800 mat sections a day, the plant required will consist of one mixer barge; two cement barges; 56 to 64 mat barges, of which 16 to 24 will be receiving load and 40 tied up for curing; two shop barges; eight spar and header barges; one quarterboat and two towboats, besides the gravel digger and six to eight gravel barges, previously described. If a curing period greater than fourteen days is required or the tow to the revetment is too far for prompt return of empty barges, the number of barges required may be increased a score or more.

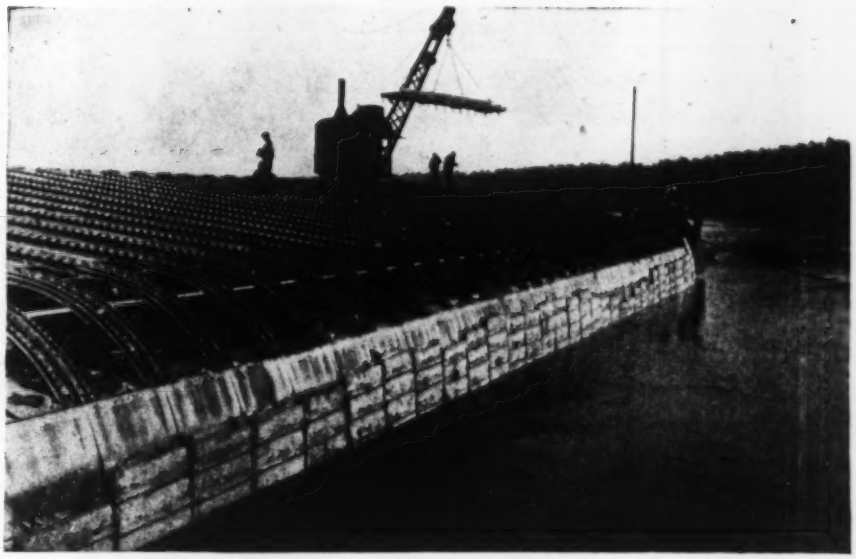


FIG. 8—GENERAL VIEW OF ASSEMBLING WAYS ON PLACING BARGE
This placing barge has room on the ways for assembling 35 mat sections, which constitutes a launch. One of the cranes, which lifts the mat sections from the mat barge (Fig. 6) and places them on the ways, appears in the background.

Of these units only the mixing-barge plant calls for details, and these are rather completely given in the drawings of Fig. 9. The particular feature is electric operation with power from a diesel electric unit, consisting of a 225-hp. engine and a 440-volt a.c. generator and three-wire circuits throughout. It needs also to be noted that the plant is equipped with necessary means for heating water and aggregates for cold-weather operation and to be emphasized that modern mechanism for batch control is adequately provided. The remaining barge units are standard steel or wood barges with housing where required, and the quarterboats and towboats are also standard. More mention is required of the equipment arrangement.

As shown by Fig. 3, there is a line of guide barges sparred out from shore in a straight line parallel to the shore. These barges are used for various shop and storage purposes and for other plant operations, but they primarily provide a mooring for the line of mat-casting barges. At the head (upstream) of the line is the quarterboat, and on shore are the tracks, storehouses and yard equipment. The mixer barge with its attached cement and aggregate barges shuttles up and down the line of casting barges, filling the mat forms as it moves upstream and dropping back idle for another casting trip. It is moved by upstream and downstream cables which lead out from two towing winches.

Mat-Casting Procedure

The mat sections are cast flat, across-barge and in tiers with aisles between them. Fig. 5 shows casting operations at the start of the second mat in the tiers, and Fig. 6 shows a mat barge being moved away with all tiers completed. The standard steel barge holds twenty tiers of

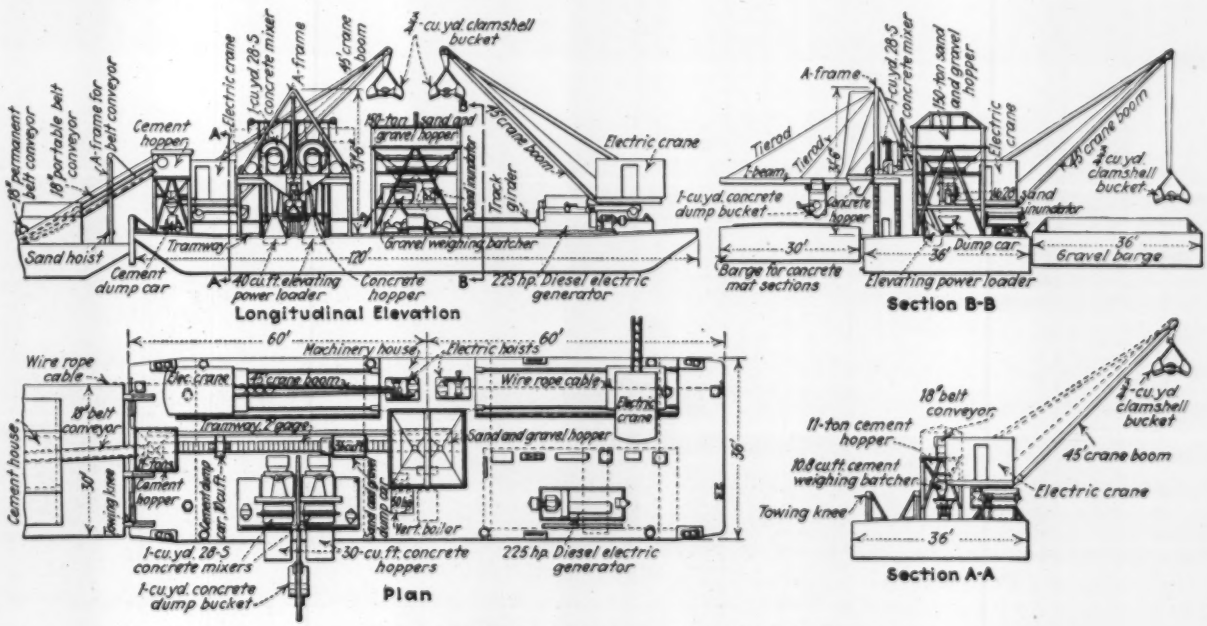


FIG. 9—MIXING BARGES FOR CASTING PLANT

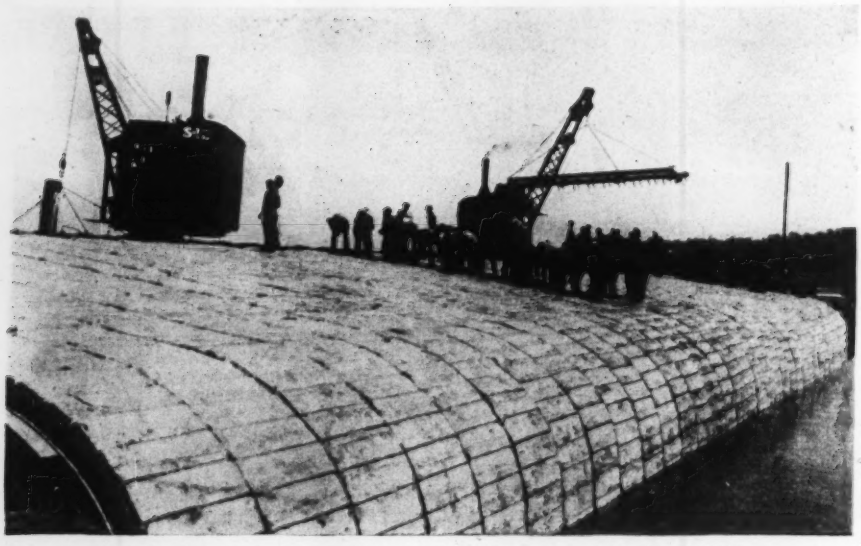


FIG. 10—COMPLETE LAUNCH OF ASSEMBLED MAT SECTIONS
The men are making the final clip and wire ties which connect the sections into a single articulated mat.

fifteen mats each; a wood barge holds about 50 mats fewer. The procedure is to move the mixing barge beginning downstream along the line of mat barges, pouring one mat in each tier. The line of casting barges then has, for continuous operation of the mixer barge, to be long enough so that when the mixer is at the head of the line enough time has elapsed from the first pouring at the tail of the line for the concrete in the first mats to have set, the forms to have been removed, the craft paper separator placed and the forms cleaned, reassembled and reset. Under average conditions the concrete will have set in four hours and the forms can be removed, prepared and reset in another hour. On this schedule each barge will be cast upon every five hours or twice per ten-hour shift. With an output of 800 mats per shift, there will be required for continuous operation twenty barges holding twenty piles of fifteen tiers per pile. So that loaded barges may be taken out and replaced with empty barges, there must in fact be two to four more barges in line if the mixer barge is to operate continuously.

The procedure of working upstream in casting is based on the handling of the mixer barge. It can be spotted more quickly and accurately when pulled against the current, and naturally the idle return trip is quicker with the current.

Wood forms were formerly used for casting the mat sections, but they have been replaced with steel forms, which cost less to maintain, keep their alignment better and hold the reinforcement more accurately. About 2,000 mat forms are required for regular operation. Each form consists of two side pieces (3x2x3/16-in. angles), two 3/16-in. plate end pieces and 24 block separators of 20-gage plates. All form members are notched about halfway up to set over the wires of the reinforcement, which is lifted up and held clear of the slab bottom by sliding clips. Fig. 5 shows mat forms in place.

A schedule of uniform production requires that about three or four filled mat barges per day shall be pulled out of line and replaced by empty barges. In starting casting with all barges empty, therefore, certain barges are skipped until a progression of loading has been established, whereby three barges become fully loaded each day with the other barges in varying stages of completeness as to loading, down to the last replacement barges on which casting has just commenced. As loaded barges are pulled out they are moored in the curing fleet, Fig. 3, from which after two weeks they are towed to the revetting operation.

With the casting progression established, the sequence of casting processes is as follows: Thirty minutes after pouring, two men go along the mat tiers, disengage the reinforcement retaining clips and lift the forms vertically about 2 in. and then let them settle back. This breaks the bond. A form-cleaning gang follows in 3½ hr., which lifts out the forms and cleans them. Close behind come men spotting the paper rolls and the reinforcing mats. A following gang spreads the paper separators, sets the

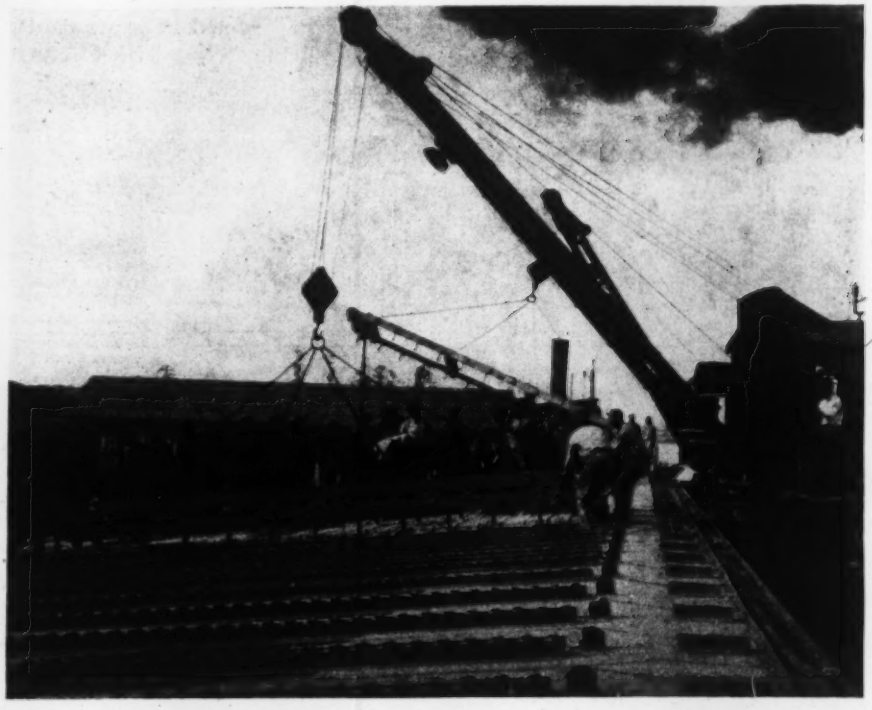


FIG. 11—LOWERING A MAT SECTION ONTO THE WAYS

reinforcing mat and places and adjusts the forms. This is a careful process as the mat sections have to be precisely superimposed in the tier (particularly in respect to their long sides), so that the grapple frames which lift and place them in the laying operation will take hold of the exposed reinforcing wires without prying and hammering.

The pouring procedure is indicated by Fig. 5; it follows form setting closely. The forms are spray oiled just ahead of pouring. Rather perfect distribution, as shown by Fig. 5, is effected in the bucket discharge, which is controlled by an operator riding the bucket. Two men with broad hoes pull the concrete from the middle to the sides of the forms, and other men with shovels spread and spade the concrete and give the top a shovel-trowel finish.

The force required for casting and curing is about 161 men, not including the crew of fifteen on the gravel digger and barges. Including the gravel crew, 42 of this force are white foremen, clerks, machine operators, etc., and the remainder are negro laborers, cooks, flunkies, etc.

Revetment Construction

The revetting operations are: (1) break clearing and grading, (2) assembling and sinking subaqueous mats and (3) paving the upper bank. Clearing is ordinary procedure; bank grading is a special-equipment operation, and the several methods will be described in a separate article.

Subaqueous Mat—The plant for and method of assembling and sinking subaqueous mat are indicated by Fig. 1. Of the plant units the placing barge is the only one calling for special description. This is a steel barge with a sloping super-deck with a capacity of 25 or 35 mat sections. At the lower side this deck curves down over the side of the barge as shown by Fig. 8. On it, running across-deck down the slope and curve, are double trains of rollers as shown by Fig. 7. The spaces between roller trains is such that the mat sections span them, as shown by Fig. 10. Under the high side of the super-deck on the main deck are anchor cable reels, one for each double train of rollers. From the reels the cables run to friction pulleys, then up through the super-deck and down the slope between the rollers of each double train and therefore between adjacent mat sections. A payoff mechanism, consisting of a long shaft and gears operated by a steam winch, pays out the cables. Back of the sloping deck is a track carrying two locomotive cranes.

Assembling is done on the roller trains of the placing barge, which at the beginning is moored close to the water's edge. The anchor cables are payed out down the deck slope to the water and there fastened to cables reaching down the river bank from inshore deadmen. Then the cranes begin lifting mats (Fig. 17) from the mat barge and placing them (Fig. 11) on the roller ways of the placing barge, one crane beginning at the upstream end and the other at mid-length of the deck. As adjacent mats are placed they are connected at sides and ends. The end connections are made by twisting together the wires projecting from the end blocks of each mat section. The side connections are made (*a*) by clipping together with U-bolt and yoke clips at 5-ft. intervals the two outside longitudinal reinforcement wires of the adjacent mat sections and the anchor cable, and (*b*) by tying the same two wires and the anchor cable with twisted double-wire ties at 1-ft. intervals between clips.

Details of the assembling process are shown by Figs. 11 to 14. The traveling cranes take hold of the mat sec-

FIG. 12—ADJACENT MAT SECTIONS SHOWING ANCHOR CABLE

Outside reinforcement wires (Fig. 2) and cable are clipped together with yoke and U-bolt clips. The man is tightening nuts on a clip.

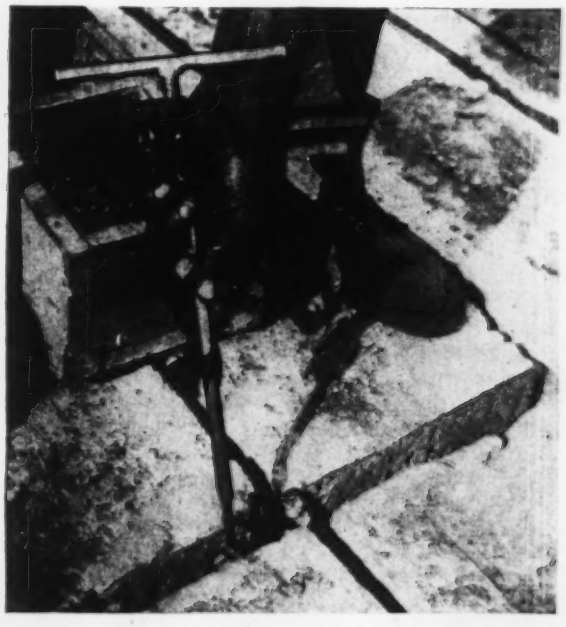


FIG. 13—PLACING CLIPS WITH SPECIAL TOOL

Clips are placed 5 ft. apart along the anchor cable with this tool. Another man (Fig. 12) screws the clips tight.

FIG. 14—PLACING WIRE TIES EVERY FOOT BETWEEN CLIPS

This tie, like the clips, engages both longitudinal reinforcement wires and the anchor cable.

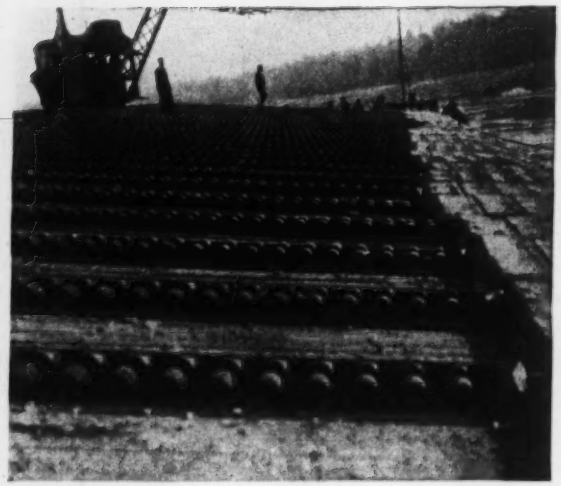


FIG. 15—LAUNCH COMPLETED READY FOR ASSEMBLING NEW LAUNCH
The top of each launch is held on the ways, so that the new launch to be assembled can be tied to it.

tions by means of a grappling frame (Fig. 17) whose hooks engage the reinforcing wires, which extend a little beyond the block ends. The grappling frame lowers the mat section onto the ways and is unhooked and swings clear for another load (Fig. 11). Tying the mat sections together is a hand-tool operation. Fig. 12 shows two adjacent mat sections with the anchor cable lying between them. A man with the tool, shown by Fig. 13, places the clips. On this tool he strings several clip yokes and then fastens a clip U-bolt in the end. With this hook he grasps the anchor cable and the two longitudinal reinforcement wires of the adjacent mat sections within the U-bolt. He then drops a yoke over the U-bolt and starts a nut on the free end. The tool is then detached for placing another clip. A man with an auger-wrench (Fig. 12) tightens the nuts on the clip. The ties between clips and the end ties are made with the twisting hook shown by Fig. 14. All clips and tie wires are galvanized and the anchor cables are 7/16- and ½-in. galvanized-wire rope. Each crane has an assembling gang consisting of about 24 men with one foreman.

A deckfull of completely assembled mat sections constitutes a launch. The payout mechanism is then set in motion, and the launch of slab sections rolls down the deck and into the water at a speed of about 5 ft. a minute. At the same time the placing barge is warped outshore a determined distance, depending on the slope of the underwater bank. The launch is stopped with the mats about in the position shown by Fig. 15. Then another launch is assembled and sunk, and this operation is repeated until the mat is completed and the placing barge is in the final position shown by Fig. 2. The last launch is then held suspended in the water until another launch has been assembled on the ways. The last launch is then cast

FIG. 17—MEN ON MAT BARGE HOOKING LIFTING FRAME ONTO MAT SECTION
The frame is lowered with a hook at each across-mat reinforcement wire (Fig. 2). When the hooks engage the wires the whole flexible mat section is lifted flat and placed on the ways. Note the wire loops which connect the ends of adjacent mat sections.

off by cutting the cables, and the placing barge with the assembled launch is warped inshore to begin another mat. To place the new mat the main mooring barges are warped upstream 130 ft.

Upper Bank Revetment—The zone of upper-bank revetment extends from the shore edge of the subaqueous mat up the bank to a contour elevation determined necessary for protection. Generally the upper bank revetment

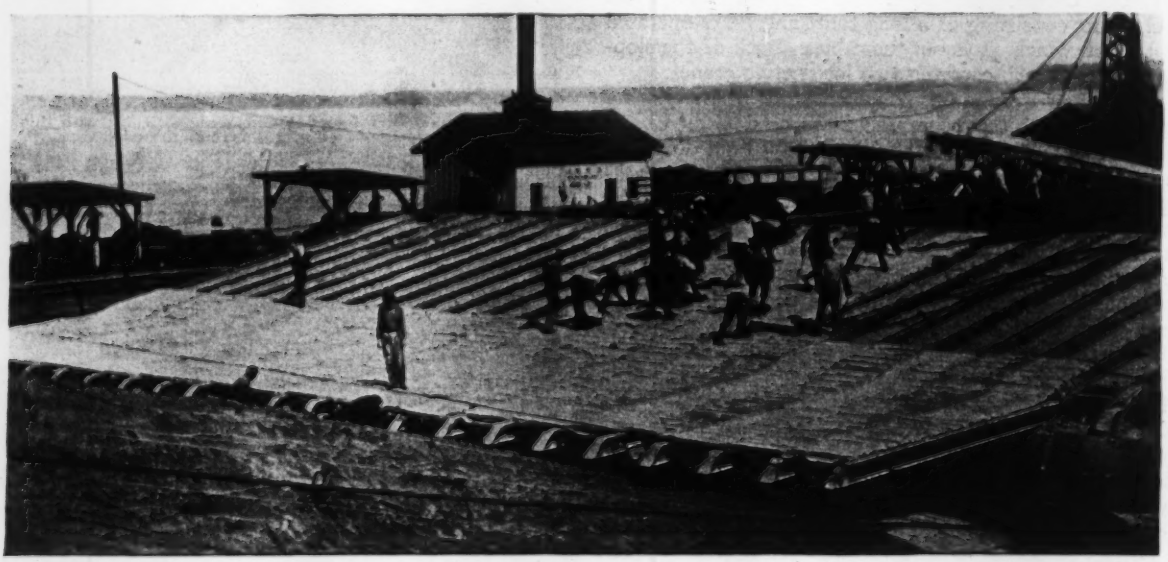


FIG. 16—MAT BARGE WITH "FINGERS" FOR LAYING CONNECTING MAT

is a 4-in. concrete slab, but sometimes it consists of mat sections placed by derrick barges and assembled on and connected to the upbank anchor cables much in the manner described for subaqueous mat. Often, when subaqueous mat is sunk at low water, a connecting mat constructed upbank is inserted between the subaqueous mat and the upper bank revetment proper. Sometimes this has been done by locomotive crane, as shown by Fig. 1, but more commonly a seven-square end-mat barge has been used. The finger method, shown by Fig. 16, is now replacing this. The 25-square mat barge is provided with steel-beam fingers, which can be drawn in and out by a rack-and-pinion mechanism driven by the same engine that pays off the anchor cables.

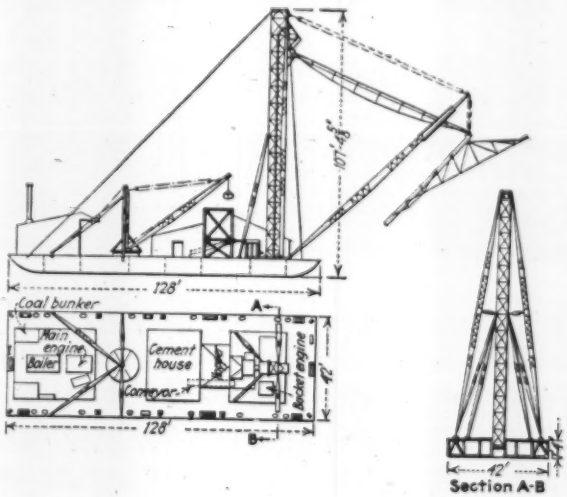


FIG. 18—BANK-PAVING BARGE WITH TOWER AND CHUTES

For slab revetment the bank is graded and hand-dressed to a slope of 1 on 4. A reinforcing mesh similar to that for mat sections is laid on the slope and embedded in the slab concrete which also embeds the anchor cables. The slab has at its upper edge an inverted curb 18 in. deep and 4 in. wide. The concrete is mixed and placed by barge plants, one style of which is shown by Fig. 18. Expansion joints normal to the river are provided about every 20 ft. The top of the slab is roughly troweled.

Performance Experience

The mean performance records per ten-hour day for placing revetment is for the large placing barge (Fig. 2) about 1,000 squares; for the locomotive crane barge (Fig. 1) about 250 squares, and for the slab-paving barges (Fig. 18) about 200 squares. An output of 800 squares per day has been settled on as an economic mean for the casting plant; it has been speeded up to 105 squares an hour on a single-hour test run.

It has been found that the greatest stress placed upon the mat sections is set up during the process of assembling and sinking. The mat sections are dropped through a distance of approximately 12 in. when placed upon the mat-sinking barge. They rest on this barge upon rows of rollers set 40 in. on centers. A series of tests showed that mat sections whose individual blocks could sustain a concentrated center of load of 500 lb. when supported on a 40-in. span could successfully be placed on the riverbank with less than 2 per cent crackage. Hence this method of testing and measure of strength was adopted rather than compressive cylinder tests. With this in mind mixes are designed to produce this strength within the time available between casting and sinking. When weather conditions are propitious and ample curing time (30 days or more) and a sufficient number of storage barges are available, mixes as lean as 11 gal. per sack have been successfully used.

After the concrete is once placed on the riverbank, its stresses diminish while its strength increases. Its life is mainly determined by the resistance of its exterior reinforcing wires and anchoring cables to corrosion. When new the reinforcing will develop much more strength than the concrete; the size of the reinforcing is principally to increase its life against corrosive action.

The Highways of Italy

By the late Pietro Lanino
Rome, Italy

IN ITALY, the highway problem is quite different from that which confronts highway engineers in the United States. In the latter country good highways have been constructed as a consequence of the increased use of the automobile; Italy has had an organized system of highways since the time of the Roman Empire, and her problem now is simply to transform this system to meet the new conditions required by motor traffic. In other words, Italy's task is the adaptation of her existing highways, not the construction of new ones.

The highways in Italy were formerly looked after by the state public works department or the provincial authorities. The assignment of the proceeds of the automobile tax to highway purposes was not in accordance with the Italian government system of budgeting, and for this reason the government created on May 18, 1928, the so-called Azienda Autonoma della Strade, or independent highways board, which has its own budget and independent administration, but is connected with and is under the control of the public works department.

This board has annual appropriations of $9,500,000 from the general public works fund, $8,000,000 from proceeds of the tax on automobiles and $500,000 from various other sources—that is to say, a total of $18,000,000, to spend on 13,125 miles of highway.

The board has prepared a program for fifteen years, divided into three periods of five years each, by which improvement of 3,750 miles of highways to meet the new conditions during each period is contemplated. It is estimated that the cost of these improvements will be $17,000 a mile, and it is expected that the improvements on the first 3,750 miles will be completed in 1934. In 1928-29, the first year of its existence, the board improved 1,000 miles on the most important highways. In Italy maintenance of highways costs an average $360 per mile a year.

Crushed rock is the almost universal base of the Italian highway structure and is covered by a bituminous surfacing. Concrete is scarcely ever used, and reinforced concrete almost never. The work is generally done by hand, machinery being but rarely employed, except for rolling. Wages are low in Italy, which is a densely populated country with very pressing employment problems. The craftsmanship of the Italian worker on earth work is quite superior. Under these conditions the Italian highways will not cost, on the average, more than $6,000 a mile. 57,000 men are now employed on the work.

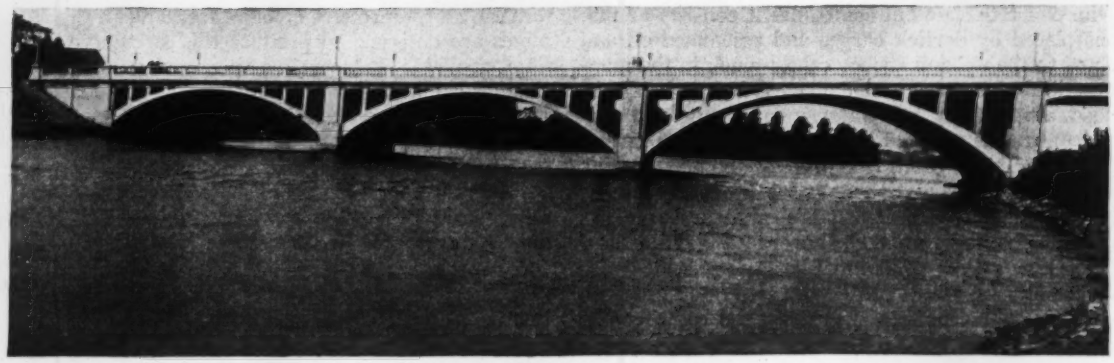


FIG. 1—RIVER SPANS OF LOGAN ST. BRIDGE OVER GRAND RIVER, LANSING, MICH.

Winter Concreting on a Three-Arch Bridge

Logan Street Bridge at Lansing, Mich., Concreted in Freezing to Sub-Zero Weather Using an Over-All Housing Heated by Steam Heaters With Fan Distribution of Warm Air

By Richard F. Rey

Structural Engineer, Office of City Engineer, Lansing, Mich.

Logan St. Viaduct, costing $425,000, was constructed in 1929-30 by the city of Lansing, Mich., to carry a main city throughfare connecting with the state trunk-line road system across the valley of the Grand River and its congestion of railway tracks. It is 1,075 ft. long and has three river spans (Fig. 1) 61, 67 and 90 ft. long, 534 ft. of reinforced-concrete viaduct, 126 ft. of concrete-incased steel-beam viaduct and earthfill approaches between retaining walls. The three arch spans have four single-center ribs 7½ ft. wide and 5 ft. apart, carrying eight longitudinal rows of spandrel columns supporting a T-beam deck. The roadway is 38 ft. wide between 10-in. concrete curbs and there is one 6-ft. sidewalk. The paving is brick-marked into four 9½-ft. traffic lanes by lines of white brick. Foundations are on rock 30 to 40 ft. below water level for the river spans and on earth for the viaduct; assumed pressures were 13 and 2 tons, respectively. The bridge was designed by the city engineering department of Lansing; the general contractors were the Folwell Engineering Co., Chicago, Ill. —Editor.

CONTINUOUS PROSECUTION of the concrete work on main-arch spans in severe winter weather and a nice procedure in handling the expansion joints were employed in the construction of the Logan St. bridge in Lansing, Mich.

Bids for construction were received late in the summer of 1928, with the thought that the foundation would be constructed during the fall and winter and a full summer season would be left for concreting the superstructure. It happened, however, that progress on the foundations was slow. In addition, the south pier cofferdam collapsed as it was about completed and caused delay. Construction of the superstructure was, therefore, carried into the winter of 1929-30. The major part of the winter work included construction of the main-arch spans over the Grand River.

Housing and Heating

The portions of the bridge constructed in winter were housed in as shown by Fig. 2. This housing was made spacious enough to provide ample room for building forms and handling concrete. It consisted of a framework covered outside with ship-lap siding sealed inside with building paper and roofed with tar paper.

Unit steam heaters kept the inclosure warm. These were standard heater units such as are used for heating industrial and commercial buildings, instead of pipe coils or cast-iron radiators. They are somewhat like the radiators for automobiles, consisting of a very efficient radiating surface and a fan to distribute the heat by air movement. Steam is fed from a boiler into the radiating elements, and the heat is widely distributed by the forced circulation of the air over the elements. This system of heating produces temperatures that are very uniform throughout a building and it is economical.

On the Logan St. viaduct the unit heaters were fed from the boilers of two cranes. Four 600-ft. and three

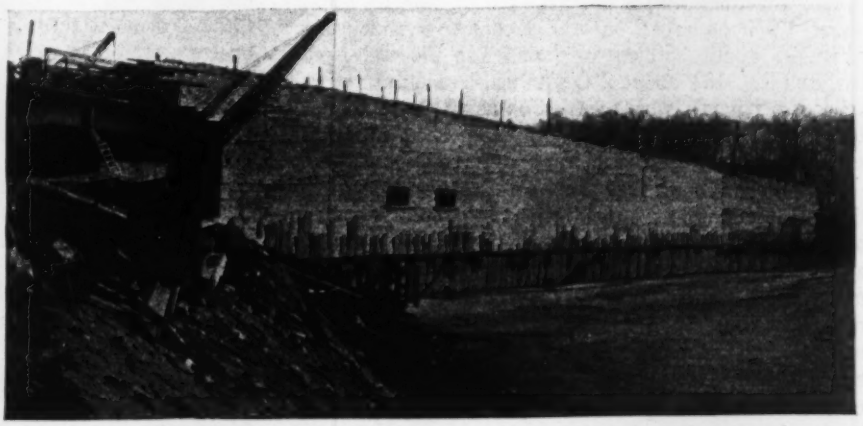


FIG. 2—OVER-ALL HOUSING FOR RIVER SPANS OF LOGAN ST. BRIDGE

400-ft. units were installed and successfully heated inclosures of from 200,000 to 300,000 cu.ft. By taking into consideration the type of framework and the prevailing winds, the heaters could be so located as to produce a fairly uniform temperature throughout the inclosure. The outside temperatures varied from around freezing to 10 deg. below zero, and the inside temperatures were kept between 60 and 70 deg. for the first part of the heating period and from 50 to 60 deg. for the last part. Despite changes in outside temperature, a uniform inside temperature could be maintained. A valuable feature was that exhaust from the heaters discharged into the air produced moist atmosphere advantageous to curing.

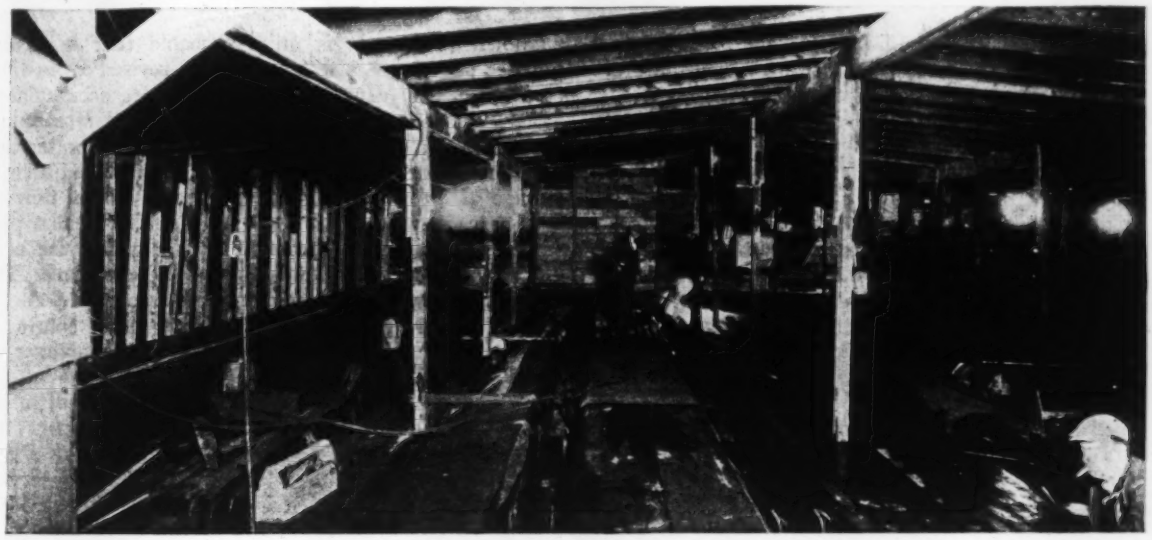


FIG. 3—INTERIOR OF HOUSING, SHOWING DECK FORMS

While unit heaters of the type described are new for winter concreting they present advantages which merit attention. The installation is comparatively simple. It requires the minimum amount of piping. The units can be suspended from the framework or housing at advantageous points for the fans to force the air to the more inaccessible places. In the Lansing bridge operation the concrete at the springing lines of the arches was particularly hard to heat as the bridge seats were very close to the river level, but the heaters kept these corners warm. The heaters are easily taken down and removed to other locations and jobs. They produce no gases or smoke to bother workmen, and the fire hazard is a minimum.

The concrete was made from aggregates heated by steam-pipe grids underneath the stock piles and water heated by passing through an old steam boiler. The temperature was not taken at the mixer, but the concrete entering the forms was between 60 and 80 deg. The temperature difference between mixer and forms was probably not great, as the mixing plant, tower and chutes were inclosed.

Expansion Joint Construction

Vertical 1-in. expansion joints were carried across the bridge over the river piers and at approximately 100-ft. intervals throughout the viaduct portions. Butt joints were employed. Double columns and column girders were constructed throughout to eliminate any sliding expansion joints. Double columns were formed and cast together. The column forms were set up and braced as single units. The separation was then made by placing a $\frac{3}{4}$x$\frac{3}{4}$-in. nailing strip up the two interior sides of the column from along the center line of the joint. Then $\frac{5}{8}$-in. tongue-and-groove lumber was nailed to each side of the nailing strips, forming a double wall 3.4 in. apart from top of footing to bridge seat. The space between was filled with sand, and both halves of the column were cast simultaneously, so that the pressures remained the same on both sides of the expansion joint form. The expansion form was easily removed after the exterior sides of the column forms had been wrecked. Upon removing the $\frac{3}{4}$-in. nailing strips the sand flowed out, loosening the expansion form so that the boards could be readily driven out.

The river foundations were carried to bedrock at varying depths of from 30 to 40 ft. below normal water level. The abutments are of the buttress type resting on 2½-ft. concrete mats. Precast reinforced-concrete struts were used in framing the abutment and pier cofferdams, so that the concrete between the top of footings and springing lines could be cast continuously without joints or the boxing out of timbers.

A 1:2½:4 mix was used for the substructure concrete and a 1:2:3½ mix for the superstructure. Handrailing and lamp-posts were cast in place, using a sand and peastone mix. Steel spindle and lamp-post forms were furnished to the contractor by the city. A fiberwood lining was placed in the formwork for the base railing and posts.

Incased steel sections were built over the main-line tracks in order that the formwork could be supported without shoring. Where track clearances could be temporarily reduced, reinforced-concrete sections were constructed. Cast-iron blast plates 4 ft. wide and $\frac{5}{8}$ in. thick were provided over all tracks.

The design was based on live loads of 200 lb. per square foot or 24-ton truck loadings, depending upon which loading produced the higher stresses. The sidewalk and handrailing sections were designed especially heavy to withstand impacts from vehicles that might get out of control and climb the curbs. The river foundations were planned to set on solid rock with resulting maximum soil pressures of 13 tons per square foot. All other foundations were based on soil pressures of approximately 2 tons per square foot.

Water-Power Operation Charts Aid in Reservoir Control

Study of Mass Diagrams Made From Past Records Makes Possible a Budgeting of Available Storage in Reservoirs of Hydro-Electric Power Plants

By Melvin D. Casler
Formerly Designing Engineer, Hudson River Regulating Board, Albany, N. Y.

A HYDRO-ELECTRIC power plant backed up by a storage reservoir presents the problem of the most efficient utilization of the available storage. The reservoir may be drawn on whenever needed if there is anything there, or it may be operated on a budget system, drawing water from storage only at such times and in such amounts as is proper and prudent in the light of probable future needs. In any particular situation such a storage reservoir, if properly operated, is theoretically capable of maintaining a definite firm flow at any given point below the dam; but if the storage is drawn on extravagantly at the wrong times the reservoir may be found depleted at a time when needed for firm flow maintenance. Further, in any proposed water-power project the storage to be provided and the installed capacity of the power plant are interrelated factors which cannot be fixed with any assurance of high efficiency without a knowledge of how to draw upon the reservoir for current needs without sacrifice of reserves for future use. Such a method of operating a storage reservoir is outlined in what follows. For simplicity a specific case is taken, but the pinciples are generally applicable.

The analysis here presented assumes a reservoir having an available storage of 30 billion cu.ft. and a turbine installation capable of taking 6,000 sec.-ft.

Fig. 1 is an operation chart devised by the writer from the above basic assumptions as applied to an actual case. The longer the time period covered by the streamflow data used in the preparation of such a chart, the greater will be its dependabiltiy as a guide for the unknown future. It is quite probable that in actual practice such a chart will have to be revised from time to time as the years pass and experience accumulates.

Fig. 1 is based on an analysis of actual streamflow records over a period of eighteen years for a watershed of 1,060 square miles. This analysis indicated that a storage of 30 billion cu.ft. would permit a firm flow of 3,000 sec.-ft. at the power plant. The figure also presumes to insure this firm flow by indicating the conditions under which it may be safely exceeded. The capacity flow of 6,000 sec.-ft. at the power plant is permitted only when that rate may be safely continued for a period of ten consecutive days without danger of subsequent reduction below 3,000 sec.-ft.

As will be apparent from the following description of the construction of the chart, this would permit a power flow of 6,000 sec.-ft. whenever the reservoir water level is above line *B* of Fig. 1. If the reservoir level falls below line *A* it is not safe to exceed 3,000 sec.-ft. Between lines *A* and *B* the flow may vary uniformly from 3,000 sec.-ft. on line *A* to 6,000 sec.-ft. on line *B*, or, as indicated in Fig. 1, the plant may be operated on a 4,000-sec.-ft. basis between lines *A* and *C* and on a 5,000-sec.ft. basis from *C* to *B*. Line *C* of Fig. 1 is drawn midway between lines *A* and *B* but could be more scientifically located by the same method used for line *B*, substituting for column 12 of Table I the corresponding flows at 5,000 sec.-ft.

If any adopted rate is too high to be maintained by the current inflow, Fig. 1 will automatically dictate a lower rate as soon as the reservoir level drops to a lower

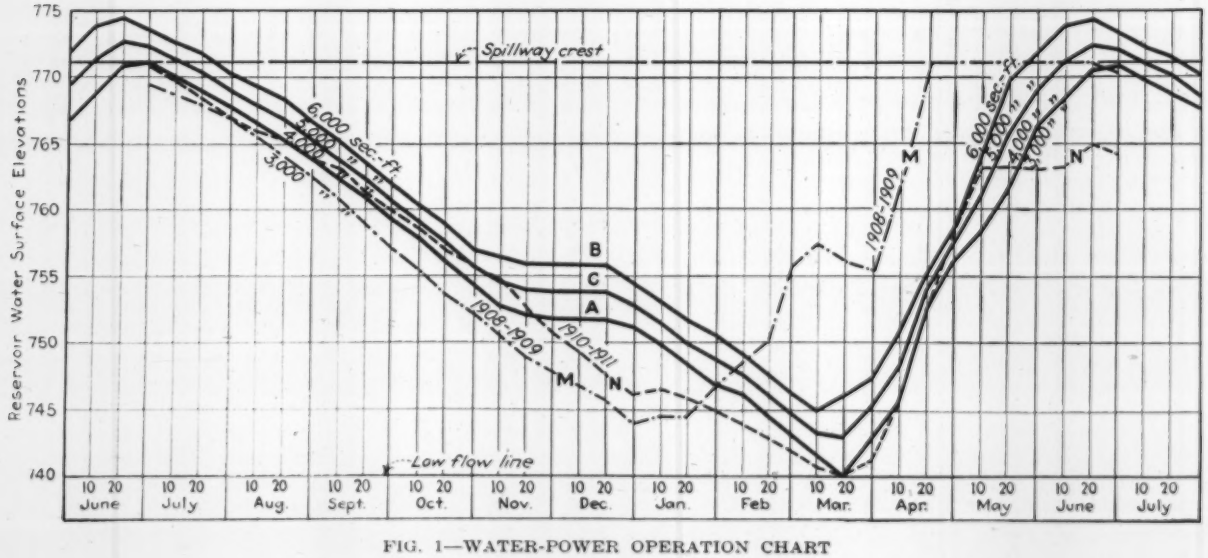
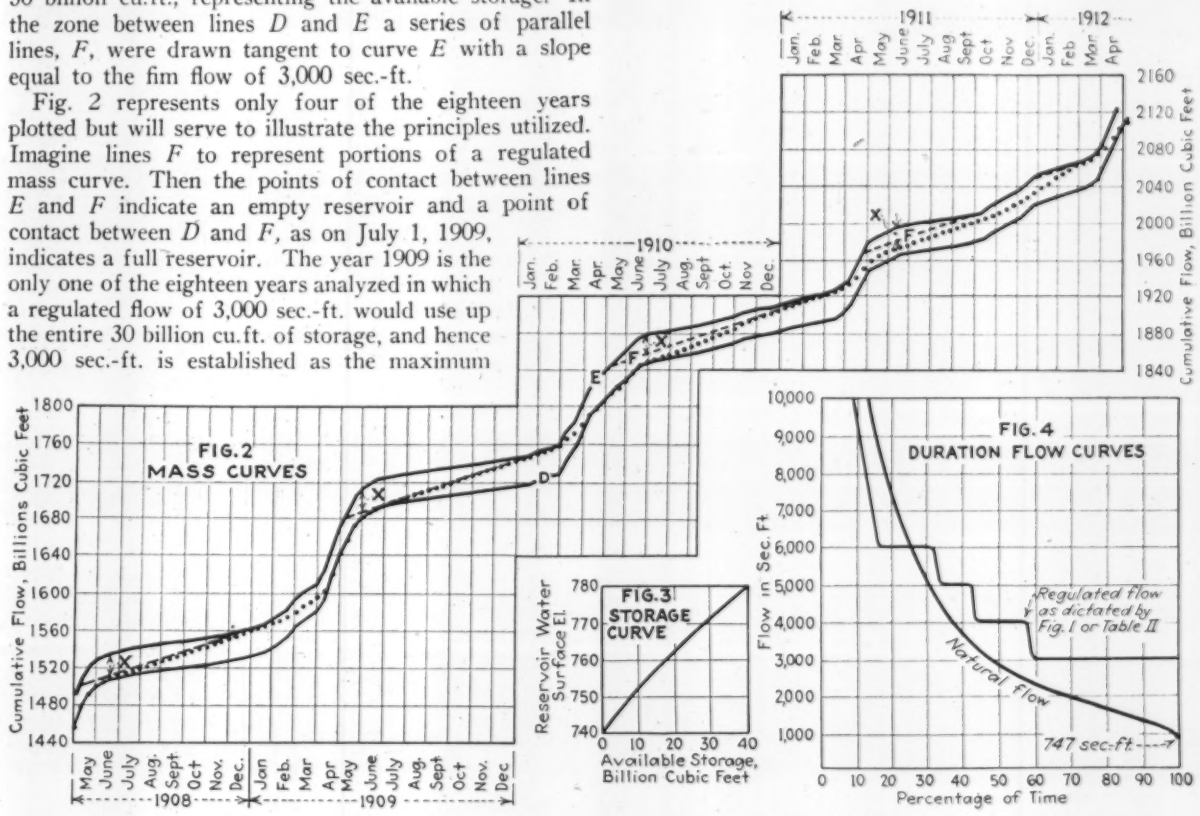


FIG. 1—WATER-POWER OPERATION CHART

zone of the chart, and, conversely, if the rate is too conservative the succeeding reservoir level will rise to a higher zone. In practice there is no reason why the chart should not be consulted daily and the operation basis readjusted whenever the chart appears to justify such action.

Line *A* of Fig. 1 was plotted as follows: A mass curve of natural flows at the power plant, line *D* of Fig. 2, was plotted for the eighteen years covered by the records. Line *E* was plotted parallel to *D* and separated from it by a constant vertical intercept of 30 billion cu.ft., representing the available storage. In the zone between lines *D* and *E* a series of parallel lines, *F*, were drawn tangent to curve *E* with a slope equal to the fim flow of 3,000 sec.-ft.

Fig. 2 represents only four of the eighteen years plotted but will serve to illustrate the principles utilized. Imagine lines *F* to represent portions of a regulated mass curve. Then the points of contact between lines *E* and *F* indicate an empty reservoir and a point of contact between *D* and *F*, as on July 1, 1909, indicates a full reservoir. The year 1909 is the only one of the eighteen years analyzed in which a regulated flow of 3,000 sec.-ft. would use up the entire 30 billion cu.ft. of storage, and hence 3,000 sec.-ft. is established as the maximum



FIGS. 2-4—CURVES FOR DETERMINING RESERVOIR DRAFTS

possible firm flow. Then the vertical intercept, *X*, between lines *E* and *F* on any particular date represents the lowest available reservoir contents on that date which would permit a minimum flow of 3,000 sec.-ft. for the remainder of the season; and the water level corresponding to the maximum of these lowest safe contents on any particular date over the eighteen-year period establishes a point on line *A* of Fig. 1 for that date, as per column 9 of Table I. Since curves *D* and *E* are parallel the intercepts *X* may be just as readily obtained by drawing lines *F* tangent to the mass curve *D*. Hence curve *E* of Fig. 2, while serving to illustrate the principles of the analysis, is unnecessary in practice except for locating the critical period which determines the firm flow; and for this purpose a tracing of the mass curve *D* may be superimposed in the position of *E*. After locating the critical period the precise value of the firm flow there may be calculated from the basic records.

Line *B* of Fig. 1 was plotted as follows: Assuming that a flow of 6,000 sec.-ft. will be maintained at the power house only when that can be done for a period of ten consecutive days without drawing the reservoir level below line *A* at the end of that period, the minimum reservoir contents on Jan. 1, for instance, which would permit 6,000 sec.-ft. to be maintained from Jan. 1 to Jan. 10 without danger of drawing the reservoir below the safe Jan. 10 level, would be obtained as follows: safe available reservoir contents on Jan. 10 = 7.92 billion cu.ft., as per column 7 of Table I. Minimum recorded natural flow at the power plant for the period Jan. 1 to Jan. 10 = 0.90 billion cu.ft., as per column 10 of Table 1. Regulated flow for the period Jan. 1 to Jan. 10 at 6,000 sec.-ft. = 5.18 billion cu.ft., as per column 12 of Table I. Hence the safe available contents on Jan. 1 for 6,000 sec.-ft. from Jan. 1 to Jan. 10 would be 7.92 + 5.18 — 0.90 = 12.20 billion cu.ft., as recorded in column 13 of Table I.

Hence, also, the figures of column 13 are made up as follows: succeeding figure of column 7 plus the succeeding figure of column 12 minus the succeeding figure of column 10.

Column 14 records the reservoir levels corresponding to the storage figures of column 13, and these levels were plotted as points on line *B* of Fig. 1. Columns 9 and 14 are derived from columns 7 and 13, respectively, by reference to a storage curve, Fig. 3.

If the turbines are operated on a 6,000-sec.-ft. basis whenever that can be done with safety for a lesser period than ten days, then line *B* would be correspondingly closer to line *A* than shown in Fig. 1.

The operation chart of Fig. 1 was applied to the actual streamflow records covering the eighteen years from 1908 to 1926, with the results indicated in Fig. 4, which shows the duration-flow curves for the natural flow and for regulation by means of Fig. 1. The

corresponding regulated mass curve as dictated by Fig. 1 is indicated by the heavy dots in Fig. 2 for the four years there shown; and the resulting reservoir surface fluctuations for the years July 1, 1908, to July 1, 1909, and July 1, 1910 to July 1, 1911, are plotted as lines *M* and *N*, respectively, as shown in Fig. 1.

Line *M* is seen to dictate 3,000 sec.-ft. from July 1 to the following Feb. 1 and 6,000 sec.-ft. from Feb. 20 to May 20; while line *N* allows 4,000 sec.-ft. or better through September, October and November, but subsequently holds the flow to 3,000 sec.-ft. to the following May 1, increasing to 5,000 sec.-ft. May 1 to May 10, but dropping to 3,000 sec.-ft. again through the month of June.

It is seen from line *N* that during the year 1910-11 the chart does not at any time permit the capacity draft of 6,000 sec.-ft., and that for only four ten-day periods does it permit a draft in excess of 4,000 sec.-ft. Justification for this is seen in the fact that in spite of this restriction the reservoir level is about 6.5 ft. lower on July 1, 1911, than on July 1, 1910.

Line *M* indicates a full reservoir from April 20, 1909, to June 20, 1909. During this period it was assumed for simplicity that the reservoir discharge equaled its inflow and that the reservoir level remained stationary at the spillway crest. As a matter of fact, inflows greater than the power plant drafts during this period would be wasted over the spillway at rates proportional to $H^{3/2}$ (*H* being the head on spillway crest), and line *M* would rise above El. 771 by amounts equal to *H*. The discharge would be less than the inflow while *H* is increasing, *H* would begin to decrease as soon as the discharge exceeds the inflow, and line *M* would again cross El. 771 when *H* becomes zero.

Those portions of lines *B* and *C* above El. 771 would indicate the proper power plant drafts in case there were flashboards on the spillway crest to prevent wastage, but the draft would not be held below the capacity draft of 6,000 sec.-ft. if such restriction were accompanied by wastage past the power plant.

In the case analyzed the storage reservoir was on a tributary of the stream on which the power plant was located ,and the head was fixed by a dam at the power plant; but the principles involved in the preparation of the operation chart are general. Regardless of the reservoir location the same identical methods would have been followed in constructing the chart after adopting the proper storage capacity and turbine installation; but if the power plant were located at the reservoir dam the economic factors involved in determining those basic assumptions would have been considerably modified. In that case, both the available storage and the power plant head would have been deter-

TABLE I—RESERVOIR OPERATING DATA

Columns 9 and 14 are plotted as lines *A* and *B* of Fig. 1 and are repeated as columns *A* and *B* of table II.

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Date	*X* in Billion Cubic Feet (See Fig. 2) 1908	1909	1910	1911	1912	Max. *X* 1908 to 1926 (B.C.F.)	Year of Max. *X*	Reservoir Water Levels for Max. *X*.	Min. Flows, 1908 to 1926 (B.C.F.)	Year of Min. Flow	Flow at 6,000 Sec.-Ft. (B.C.F.)	Res. Storage for 6,000 Sec.-Ft. (B.C.F.)	Reservoir Water Levels for 6,000 Sec.-Ft.
Jan. 1	.....	.....	2.77	5.04	0.85	9.10	1914	751.2				12.20	754.5
									.90	1910	5.18		
10	.....	.....	1.08	5.45	2.15	7.92	1914	749.9				10.80	753.0
									.93	1910	5.18		
20	.....	.....	0	4.88	1.90	6.55	1914	748.3				9.45	751.6
									1.58	1925	5.70		
Feb. 1	.....	.....	1.42	4.09	1.70	5.33	1914	746.9				8.56	750.6
									1.25	1918	5.18		
10	.....	.....	0.83	3.35	1.49	4.63	1914	746.1				7.22	749.1
									1.27	1914	5.18		
20	.....	.....	0.04	2.46	0.92	3.31	1914	744.4				5.91	747.6
									.99	1914	4.67		
March 1	.....	.....	.....	1.77	0.56	2.23	1914	743.1				4.82	746.3
									1.39	1914	5.18		
10	.....	.....	.....	0.84	....	1.03	1914	741.5				3.62	744.8
									1.56	1914	5.18		
20	.....	.....	.....	.....	....	0.00*	....	740.0				4.47	745.9
									3.35	1926	5.70		
April 1	.....	.....	.....	.....	....	2.12*	....	742.9				5.72	747.4
									3.66	1915	5.18		
10	.....	.....	.....	.....	....	4.20	1913	745.5				8.76	750.8
									6.84	1921	5.18		
20	.....	.....	.....	.....	....	10.42	1913	752.6				13.08	755.4
									6.02	1915	5.18		
May 1	.....	.....	.....	.....	....	13.92	1913	756.3				16.51	758.9
									4.76	1913	5.18		
10	7.18	5.71	0.50	9.60	....	16.09	1913	758.4				22.02	764.1
									2.58	1913	5.18		
20	18.87	19.42	2.53	11.31	....	19.42	1909	761.6				28.51	769.8
									2.15	1921	5.70		
June 1	24.51	24.96	8.21	12.03	....	24.96	1909	766.7				31.14	772.0
									1.35	1915	5.18		
10	25.86	27.31	15.19	12.34	....	27.31	1909	768.7				33.62	774.1
									1.31	1915	5.18		
20	25.56	29.75	20.76	14.47	....	29.75	1909	770.8				34.20	774.5
									.9*	1914	5.18		
July 1	25.10	30.00	21.30	13.55	....	30.00	1909	771.0				32.97	773.5
									.95	1912	5.18		
10	24.29	28.74	19.92	12.11	....	28.74	1909	770.0				31.58	772.4
									1.00	1912	5.18		
20	23.37	27.40	18.34	10.76	....	27.40	1909	768.8				30.71	771.6
									1.08	1911	5.70		
Aug. 1	22.05	26.09	16.58	8.99	....	26.09	1909	767.7				28.72	770.0
									.98	1913	5.18		
10	20.53	24.52	15.52	7.40	....	24.52	1909	766.3				27.70	769.1
									.81	1913	5.18		
20	19.05	23.33	14.92	5.72	....	23.33	1909	765.3				26.62	768.1
									.82	1913	5.70		
Sept. 1	17.27	21.74	13.28	3.98	....	21.74	1909	763.8				24.71	766.5
									.65	1913	5.18		
10	15.49	20.18	12.64	2.72	....	20.18	1909	762.4				23.11	765.1
									.65	1913	5.18		
20	13.62	18.58	11.52	1.60	....	18.58	1909	760.8				21.39	763.5
									.78	1908	5.18		
Oct. 1	11.81	16.99	11.04	.....	....	16.99	1909	759.3				19.66	761.9
									.94	1923	5.18		
10	10.23	15.42	10.49	.....	....	15.42	1909	757.8				18.03	760.3
									.87	1923	5.18		
20	8.53	13.72	9.65	.....	....	13.72	1909	756.1				16.57	758.9
									1.16	1909	5.70		
Nov. 1	7.00	12.03	9.44	.....	....	12.03	1909	754.3				14.62	757.0
									.98	1909	5.18		
10	5.51	10.42	10.29	.....	....	10.42	1909	752.6				14.03	756.4
									1.01	1909	5.18		
20	4.19	8.84	9.86	.....	....	9.86	1910	752.1				12.94	†755.3
									1.35	1909	5.18		
Dec. 1	3.20	7.60	8.95	.....	....	9.11	1913	751.2†				13.53	755.9
									1.21	1909	5.18		
10	2.33	6.22	7.75	.....	....	9.56	1913	751.7				14.12	†756.4
									.96	1909	5.18		
20	1.42	4.59	6.33	.....	....	9.90	1913	752.0†				13.77	†756.0
									1.03	1909	5.70		

*The mass curves furnished no criteria for these points and hence the reservoir was assumed as depleted on March 20 in preparation for spring floods. 2.12 is an interpolation between 0.00 on March 20 and 4,20 on April 10.

†These points slightly adjusted in plotting to wipe out undulations.

TABLE II—WATER-POWER OPERATION SCHEDULE

Date	— Operation Limits* — A	C	B	Date	— Operation Limits* — A	C	B
Jan. 1....	751.2	752.9	754.5	July 1....	771.0	772.3	773.5
10....	749.9	751.5	753.0	10....	770.0	771.2	772.4
20....	748.3	750.0	751.6	20....	768.8	770.2	771.6
Feb. 1....	746.9	748.8	750.6	Aug. 1....	767.7	768.9	770.0
10....	746.1	747.6	749.1	10....	766.3	767.7	769.1
20....	744.4	746.0	747.6	20....	765.3	766.7	768.1
Mar. 1....	743.1	744.7	746.3	Sept. 1....	763.8	765.2	766.5
10....	741.5	743.2	744.8	10....	762.4	763.8	765.1
20....	740.0	743.0	745.9	20....	760.8	762.2	763.5
April 1....	742.9	745.2	747.4	Oct. 1....	759.3	760.6	761.9
10....	745.5	748.2	750.8	10....	757.8	759.1	760.3
20....	752.6	754.0	755.4	20....	756.1	757.5	758.9
May 1....	756.3	757.6	758.9	Nov. 1....	754.3	755.7	757.0
10....	758.4	761.3	764.1	10....	752.6	754.5	756.4
20....	761.6	765.7	769.8	20....	752.1	754.0	755.9
June 1....	766.7	769.4	772.0	Dec. 1....	751.7	753.8	755.9
10....	768.7	771.4	774.1	10....	751.7	753.8	755.9
20....	770.8	772.7	774.5	20....	751.7	753.8	755.9

*Draft of 3,000 sec.-ft. to be maintained if reservoir water level is lower than *A*.
Draft of 4,000 sec.-ft. to be maintained if reservoir water level is between *A* and *C*.
Draft of 5,000 sec.-ft. to be maintained if reservoir water level is between *B* and *C*.
Draft of 6,000 sec.-ft. to be maintained if reservoir water level is higher than *B*.

mined by the storage dam, whereas in the present case each of those factors involved its own dam and pondage costs. Furthermore, with the power flow only partially controlled, the regulated duration curve of Fig. 4 involved consideration of the uncontrollable flows at the power plant. If reservoir and power plant are widely separated there is introduced a time interval between the release of water from the reservoir and its arrival at the power plant. All flows other than 3,000, 4,000, 5,000 and 6,000 sec.-ft. on the regulated duration curve of Fig. 4 are flows in excess of the rates dictated by the chart, due to unavoidable flood spillage or to uncontrolled flow entering the main stream between reservoir and power plant.

Fig. 1 is a graphical plot of the operation schedule and is useful in plotting actual operation records, as illustrated by lines *M* and *N*; but in practice it may be more convenient to regulate the draft by reference to Table II, which is Fig. 1 arranged in tabular form. An operation chart similar in form to Fig. 1 for the operation of a navigation canal reservoir is illustrated and described in the 1920 report of the New York state engineer and surveyor.

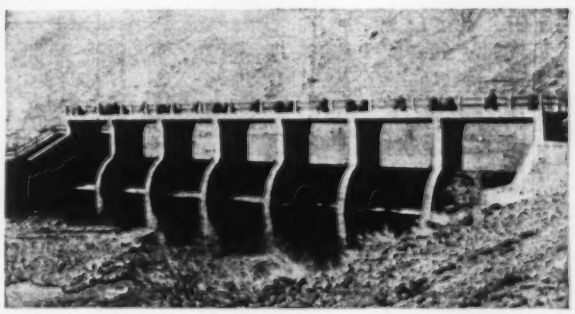
Nisqually Glacier Receding

Although the records of Nisqually Glacier, in which the Nisqually River has its source, are far from complete, they show an average annual recession of 70 ft. over a period of 45 years. This statement was made recently by Llewellyn Evans, superintendent of the light department of the city of Tacoma, through whose La Grande power plant the Nisqually River flows. Mr. Evans, who has been studying rainfall conditions in that section in order to determine the amount and movement of the ice and the amount of runoff from the glacier, stated that several cross-sections of the glacier had been taken this year at various points, and permanent monuments were placed on the adjacent cliffs so that records can be accurately kept from year to year. The uniform decrease in rainfall in the city of Tacoma from 54 in. in 1902 to 23 in. in 1929 has brought about a situation which is being given serious attention by local engineers, particularly those engaged in hydro-electric plant work.

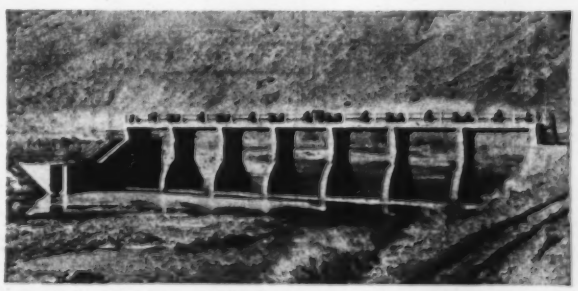
Hinged Steel Weir Gates in the Vale Project Diversion Dam

Gate Panels Lowered Into Structures Below Spillway Lip to Leave Clear Space Between Piers for Passage of Large Ice Cakes

THE HARPER diversion dam recently completed on Malheur River in eastern Oregon serves the canal system of the Vale irrigation project. Although the function of the dam is primarily to divert streamflow into the canal system, head regulation at this intake is desirable; the design was also influenced somewhat by the fact that it is necessary to pass about half the flow downstream to the holders of prior water rights. At the same time it was necessary that any obstruction to streamflow should be such that it would not interfere with the passage of large blocks of ice which seasonally pass down this channel. The design that was developed in the Denver office of the Bureau of Reclamation to meet these requirements is described in the following.



DOWNSTREAM SIDE WITH WEIR GATES RAISED
Note arrangement of lifting devices on crest.



DOWNSTREAM SIDE WITH WEIR GATES LOWERED
Waterways unobstructed for the passage of large ice cakes.

The maximum flood on record at the dam site since the construction of the Warmsprings Reservoir on the middle fork of the Malheur River is 6,600 sec.-ft., and it was considered safe to provide a spillway in the form of seven openings, 20 ft. wide by 20 ft. high. To provide means whereby the overflow lip in this spillway could be raised as desired, it was decided to use steel panels or weir gates hinged at the bottom, which can be swung upward by mechanism on top of the dam. When not needed, the gates can be lowered below the lip of the spillway so that except for the rods at the sides, used in raising them, no obstruction remains in the openings.

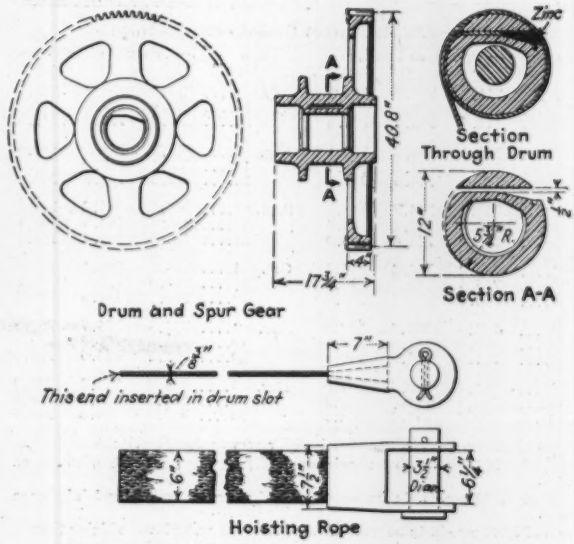
The seven weir gates used in these openings consist of standard structural-steel shapes and plates made up into panels approximately 12x20 ft. in size, hinged to the

concrete by 3-in. pins at the lower corners. The gates are swung upward by connections with "ear plates" at the upper corners, to which are attached steel rods 2¼ in. in diameter and 12 ft. long. At their upper end these rods connect through a clevis with a ⅜x6-in. flat wire rope extending up through the floor of the superstructure to a drum on the hoist. Thus it was possible to employ a drum of small diameter and yet have an operating unit amply strong for handling a very heavy load.

The flat cable used has a minimum breaking strength of 190,000 lb. and is approved for a safe working load of 34,000 lb. Attachment of these cables to the drum includes one and one-half dead laps.

Each pairs of drums, set about 20 ft. apart above the gate, is operated through reduction gearing by the same main drive shaft. Motive power is supplied to the gear train from a 10-hp. gasoline engine through a worm and a worm gear at the center of each main drive shaft, this arrangement providing a gear reduction between engine speed and drum of 2,520 : 1. Each gate is raised at speed so slow that to move from open to closed position or vice versa requires about 30 minutes.

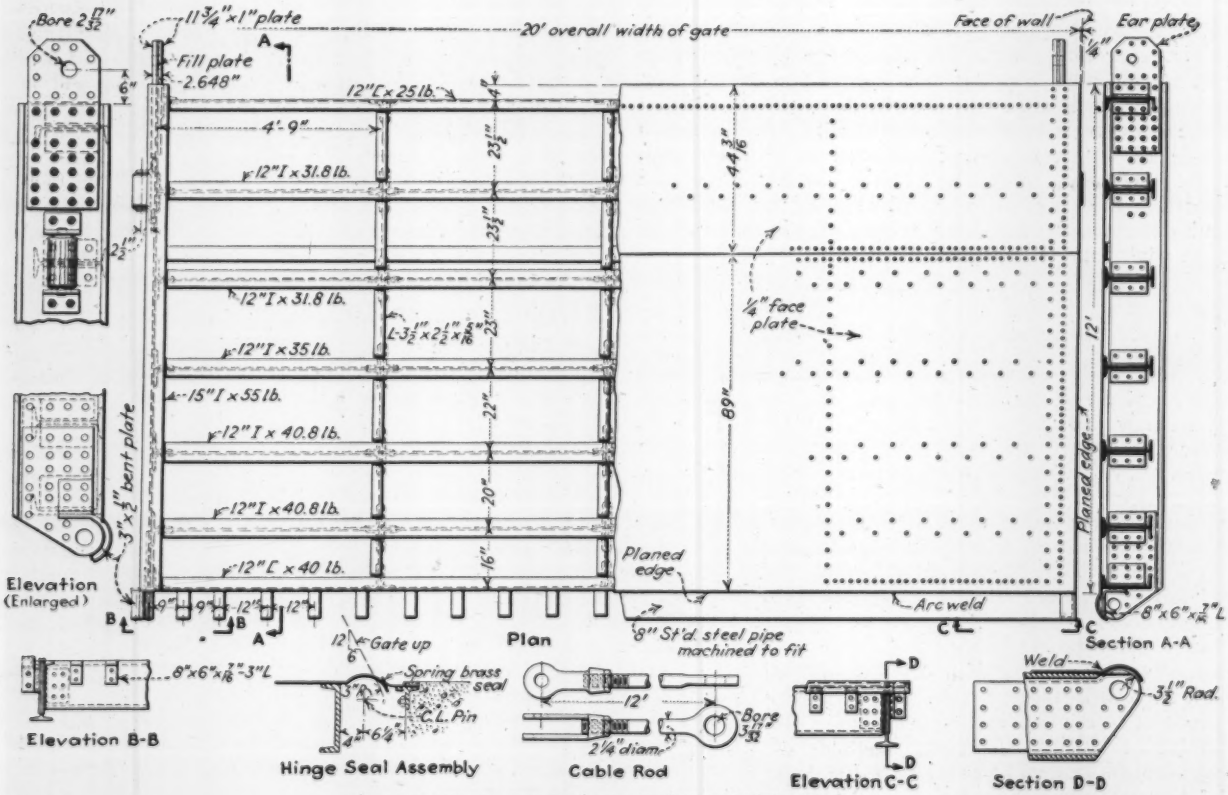
Because simultaneous operation of these gates will not be required as an emergency operation, it was considered sufficient to provide one portable operating unit for the group of seven gates. This unit consists of a small gasoline engine mounted on a truck that travels lengthwise over the dam. With this arrangement the engine can be moved to any unit and connected by a jaw clutch to the worm drive. The worm has a single thread, and the angular contact is such that there is no danger of reversal, regardless of the position of the gate when the motor is removed.



FLAT WIRE ROPE AND DRUM ATTACHMENT

The wiring circuit from battery to magneto on the engine is so arranged that the engine cannot be started until connection is made with a circuit at the gate mechanism. The latter circuit contains a limit switch which opens the electrical circuit when the gate reaches extreme position in either direction. This provides an automatic safeguard against dangerous tension in the cables due to carelessness in operation.

Construction is directed by H. W. Bashore, construction engineer, Bureau of Reclamation, Vale, Ore.



STEEL WEIR GATE ASSEMBLY AND HINGE DETAILS

Black Canyon at the dam site. The dam is to be built where the low point of land juts out into the river.

Hoover Dam Plans Ready for Bidding

Structure to Be Built of Grouted Columnar Units With Embedded Refrigeration System to Control Shrinkage and Thermal Changes—Proposals for Entire Work Under a Single Contract Covering Seven-Year Construction Period to Be Opened March 4

PLANS for the great Hoover Dam, to be built by the United States Bureau of Reclamation at Black Canyon on the Colorado River 30 miles southeast of Las Vegas, Nev., have reached the bidding stage. Bids for the construction of the 730-ft. dam and appurtenant structures will be opened March 4, 1931, at the office of the bureau in Denver. Dam, diversion tunnels, power house, spillways, intake and outlet works and an inclined freight elevator on the Nevada side of the gorge will be included in a single contract. If the contract can be awarded by April 1, as is now the intention, actual construction on the project will begin next summer. Entire completion is scheduled for seven years after awarding the contract, but preliminary power is expected to be generated by the plant within five years and four months after starting construction. Of the total sum of $165,000,000 appropriated by Congress for the project, including the All-American Canal, $108,000,000 is available for expenditure at Black Canyon.

In their large features the plans are substantially the same as outlined by Raymond F. Walter, chief engineer of the bureau, in *Engineering News-Record*, Feb. 6, 1930, p. 247. The details have since been worked out very thoroughly. A few changes have been made: increasing the height of the dam by 25 ft. (to crest level 1,232); a new spillway design; and a change in location of the intake towers. The act of Congress authorizing the project requires that an engineering board of review approve both the exact location of the dam and final plans. A special board has been appointed to consider details of concrete mixtures, methods of placing and temperature control of concrete in the dam.

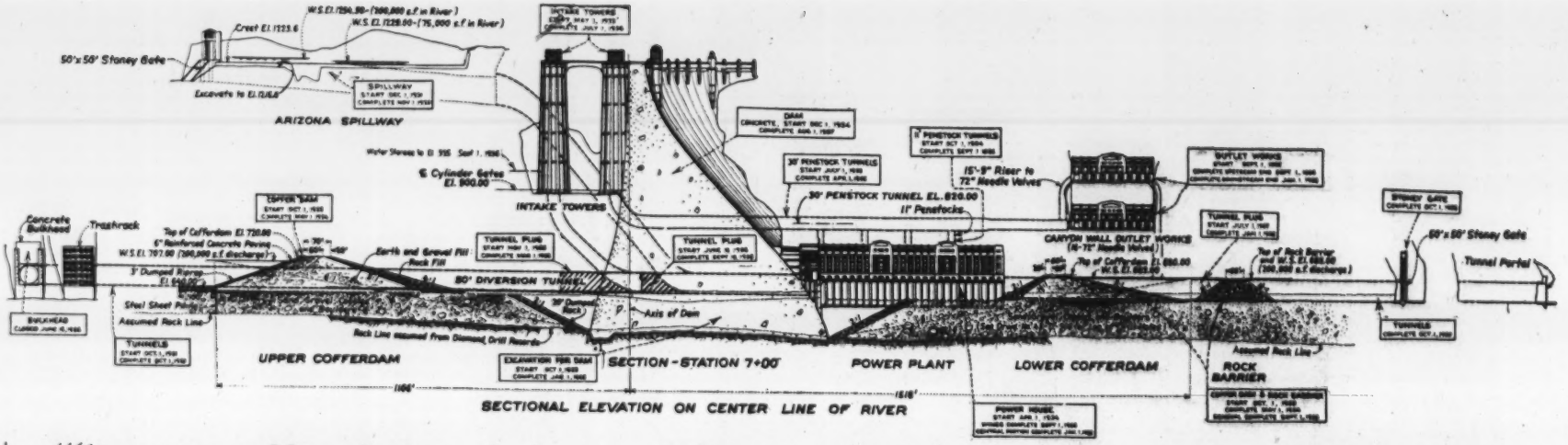
To provide access to the site for both men and materials and to provide suitable habitation for the large population that will be connected with the construction work for a long period of time, new railroads, highways and a town, Boulder City, Nev., are being built. All of the transportation facilities and the new town will be under the control of the government.

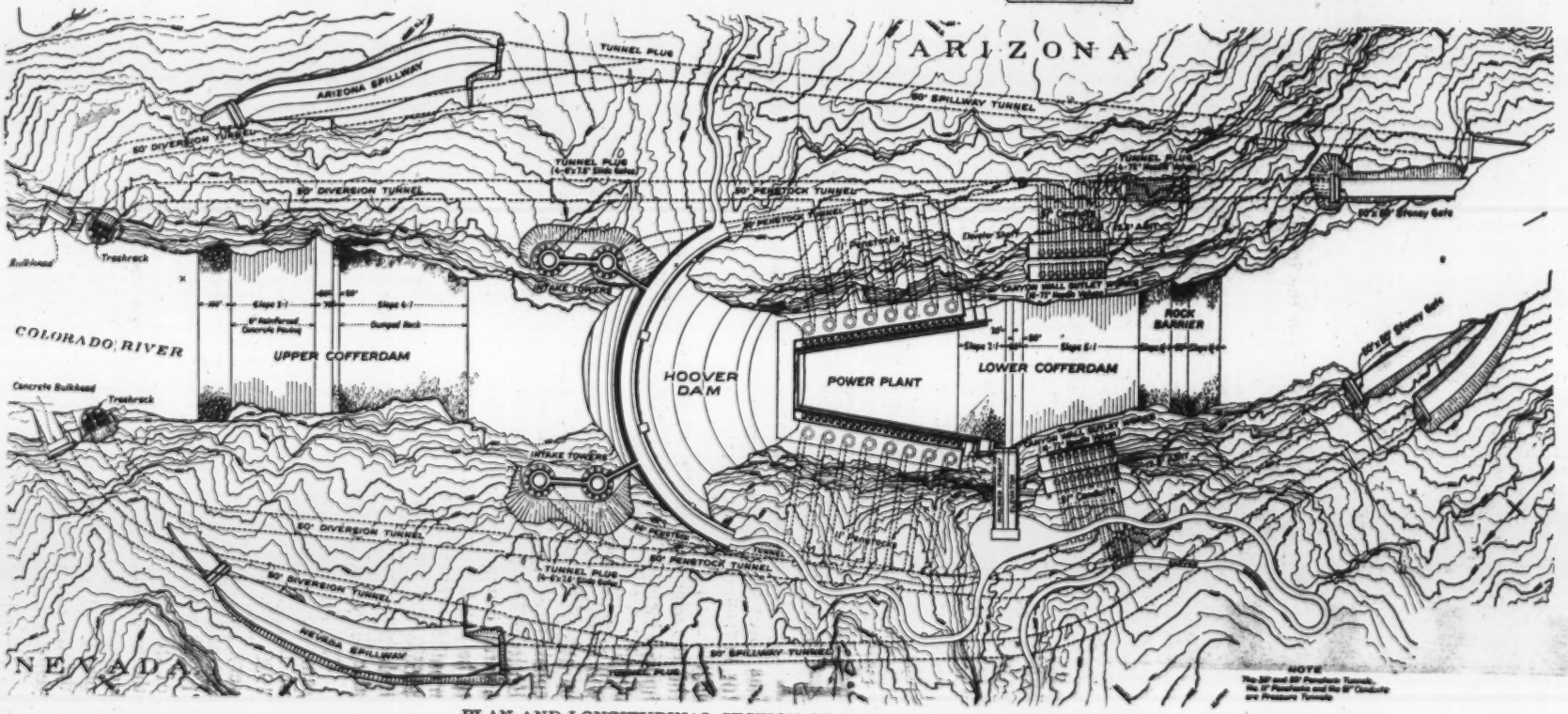
Description of Project

The major items of the project consist of the dam, four 50-ft. diversion tunnels (two of which will be later used as spillway conduits and two as penstock tunnels), a power house containing twelve or sixteen units, four 30-ft. diameter intake towers, four outlet valve houses located on the canyon walls, two overflow spillways each 700 ft. long and connected to the diversion tunnels by inclined shafts from 50 to 70 ft. in diameter, and an inclined freight elevator capable of handling heavy equipment from the highway near the top of the cliff down to the power house level.

Dam—The dam is a concrete gravity-section structure 730 ft. high from lowest point of foundation to top, 1,180 ft. long on the crest and built in the form of an arch of 500-ft. radius on the axis. Approximately 3,407,000 cu.yd. of concrete will be contained in the dam alone. A cutoff trench will be excavated in the foundation rock along the upstream toe. The foundation and abutment rock will be drilled and pressure grouted, the grout holes varying in depth up to a maximum of 150 ft. Following in elevation the general cross-section of the gorge, a main drainage gallery will be placed 6 ft. downstream from the dam axis, rising by steps with the abutments. Drainage holes will be drilled into the abutments and foundation from the main drainage gallery.

River Diversion—Diversion of the river during construction will be taken care of by four concrete-lined





PLAN AND LONGITUDINAL SECTION OF THE BOULDER CANYON PROJECT
Schedule dates for the start and completion of each major operation are shown.

circular tunnels 50 ft. in diameter, all on one level and about 4,000 ft. long. These tunnels are designed to pass a flow of 200,000 sec.-ft. After the tunnels have served their purpose as diversion works, the two inner ones will be utilized as penstocks and the two outer ones will act as spillway discharge conduits.

Immediately below the dam is the power house, a U-shaped structure with a wing on each canyon wall. Each wing will house six and possibly eight power units. The main dimensions of the wings are: length, 500 ft.; width, 66 ft.; height, generator floor to roof, 85 ft. Half of the power penstocks on each side of the river will divert from 30-ft. tunnels leading from two of the intake towers; the other half will divert from the inner diversion tunnels, which will be connected with the other two intake towers.

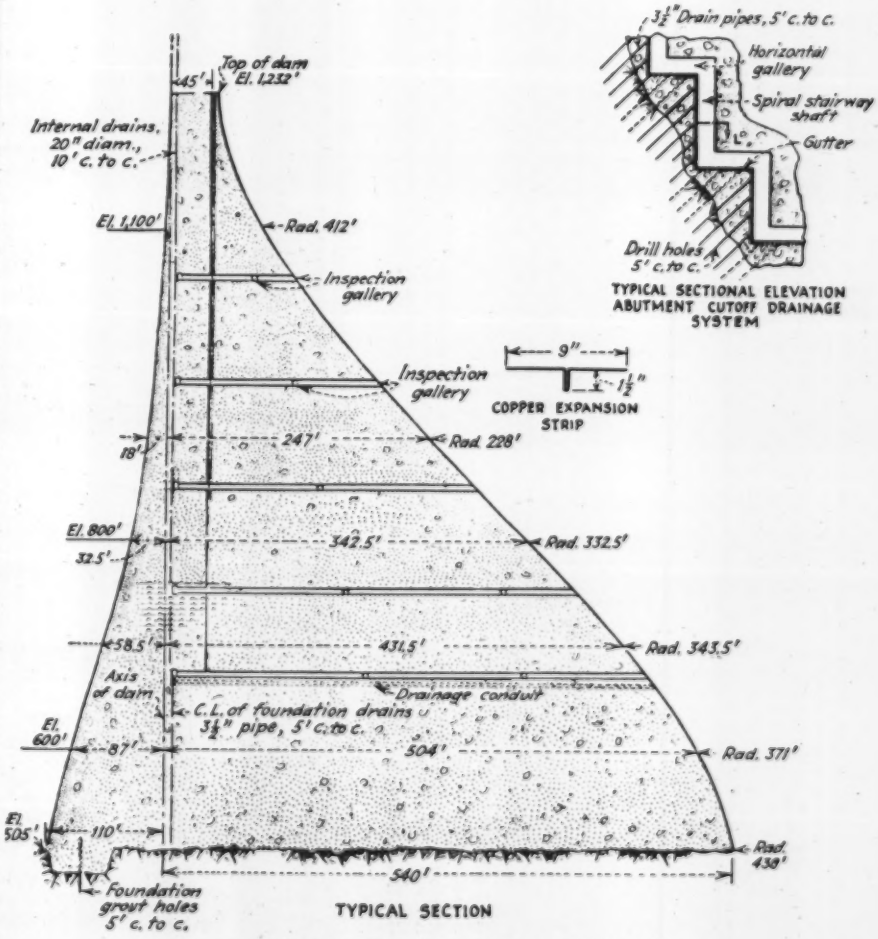
Two spillways will be constructed, one on each side of the river. Each of these will consist, in downstream order, of 50x50-ft. stoney gate, a concrete ogee overflow crest at El. 1,223.6 about 700 ft. long, concrete-lined open channel a concrete-lined inclined shaft, 70 ft. in diameter at the top and 50 ft. in diameter at the bottom, leading from the open channel to the outer diversion tunnel. The outer diversion tunnel, after having served its purpose in diverting the river, will be plugged with concrete immediately upstream from this junction with the inclined spillway tunnel and the downstream portion will become a part of the spillway system. In order to unwater the outer diversion tunnel so that the concrete plug may be constructed, a large concrete bulkhead will be constructed directly in front of the upstream portal of the tunnel. This concrete bulkhead will rest on three supporting columns of concrete, the base of the columns resting on sand placed in concrete-lined wells. The bulkheads will be lowered into place by jetting the sand from the wells through pipes placed in the columns.

Outlet Works—Outlet works similar in design will be constructed on both sides of the river, the capacity on each side being the same. The works on each side will consist of two separate systems, each regulated by a cylinder gate in the bottom of an intake tower, the two towers being about 65 ft. apart in a line parallel to the river. The system regulated from the upstream intake tower will consist, in downstream order, of the tower with the cylinder gate 31 ft. in diameter discharging into a 30-ft. inclined tunnel connecting with the inner diversion tunnel; the upstream tunnel plug in the diversion tunnel with temporary slide gates; the inner diversion tunnel below the upstream tunnel plug; two series of canyon wall outlet gates and needle valves, one placed above the other; a downstream tunnel plug with outlet gates and needle valves and a 50x50-ft. stoney gate at the outlet end of the inner diversion tunnel. Each of the four canyon wall outlet works will contain eight 72-in. needle valves for the discharge control. The system regulated from the downstream intake tower will consist of the tower with a cylinder gate 31 ft. in diameter discharging into a 30-ft. horizontal penstock, leading to the canyon wall outlet gate. Individual penstocks for each turbine will take off alternately from the 30-ft. penstock tunnel and from the 50-ft. penstock tunnel.

An inclined freight elevator will be located on the slope of the canyon wall immediately downstream from the power house on the Nevada side of the river. The top of the structure will connect with the highway at about El. 1,261, and the bottom elevation will be about 657. This elevator will be equipped to handle railroad freight cars.

A highway will connect with the end of the construction highway being built under separate contract and will descend by light grades to the crest of the dam on the Nevada side of the river, passing the top of the inclined freight elevator. After crossing over the canyon to the Arizona side on the roadway along the crest of the dam, the highway grade will rise to a terminus above the canyon rim, where it will connect with the state highway to be constructed at a later date.

Construction Cofferdams—Two rockfill cofferdams will be built to El. 720, one upstream and one downstream



MAXIMUM CROSS-SECTION OF THE DAM

from the dam site. For the protection of the downstream cofferdam against erosion a heavy rock barrier will be placed across the stream below the cofferdam. A sheet-pile cutoff wall will be driven under the upstream toe of the upper cofferdam, and the upstream face of this cofferdam will be paved with concrete.

The accompanying table shows the major quantities involved in the work.

EXCAVATION AND FILL			
Tunnels and shafts cu.yd.	1,912,000	Other excavation, cu.yd.	2,295,000
Stripping canyon walls of loose rock, cu.yd.	150,000	Excavation for highway, cu.yd.	113,700
Dam and power house foundation, cu.yd.	1,292,000	Upper cofferdam fill, cu.yd.	732,000
		Lower cofferdam fill, cu.yd.	500,000
CONCRETE			
Tunnel lining, cu.yd.	367,000	Spillway structures, cu.yd.	80,000
Upper cofferdam paving slab, cu.yd.	3,500	Tunnel plugs and penstocks, cu.yd.	147,000
Dam, cu.yd.	3,407,000	Other concrete	319,000
OTHER QUANTITIES			
Gunite, sq.yd.	50,000	Steel sheet piling, lb.	704,000
Pipe and valves, lb.	6,600,000	Grout and drain holes, lin.ft.	378,000
Reinforcing bars and rails, lb.	35,000,000	Steel tunnel ribs, lb.	3,170,000
Pipe conduit lining, lb.	20,348,000	Gates and hoists, lb.	17,560,000
Structural steel, lb.	20,793,000	Needle valves, lb.	4,070,000
Copper water stops, lin.ft.	150,000		

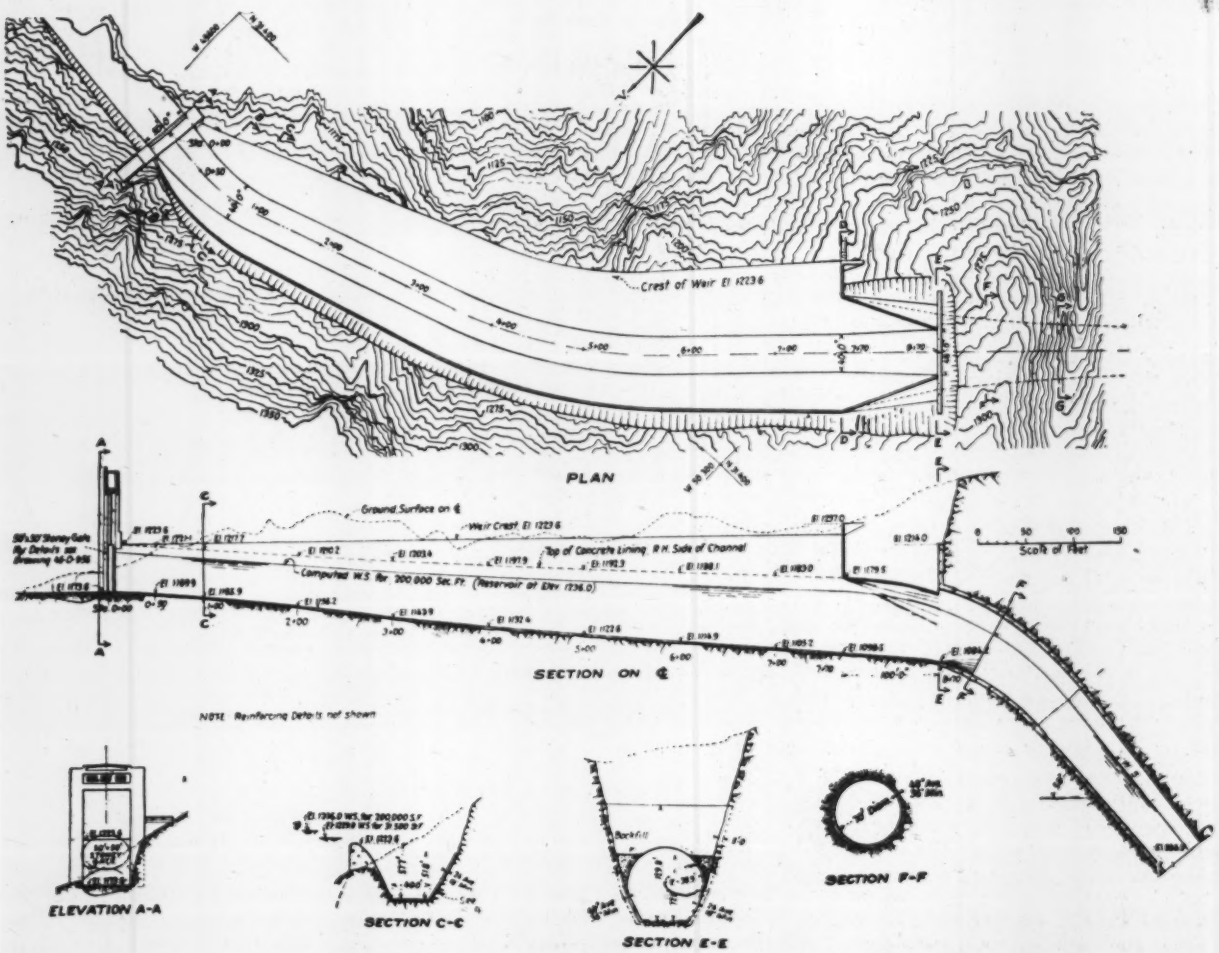
Contract Conditions

The specifications contain several important special conditions. One of these is the assumption by the government of all flood risks after the cofferdams have been accepted. After the upstream cofferdam and its rock blankets, the downstream cofferdam and its rock barrier and the rock protection on the two excavated slopes to bedrock have all been completed, the four diversion tunnels completed and the river satisfactorily diverted through them, the government will accept in writing the cofferdams and rock barrier. After the date of this written acceptance the government will assume liability for any damage to the work due to flood or other causes not the fault of the contractor, but not for damage to the contractor's plant and equipment nor for any incidental damages.

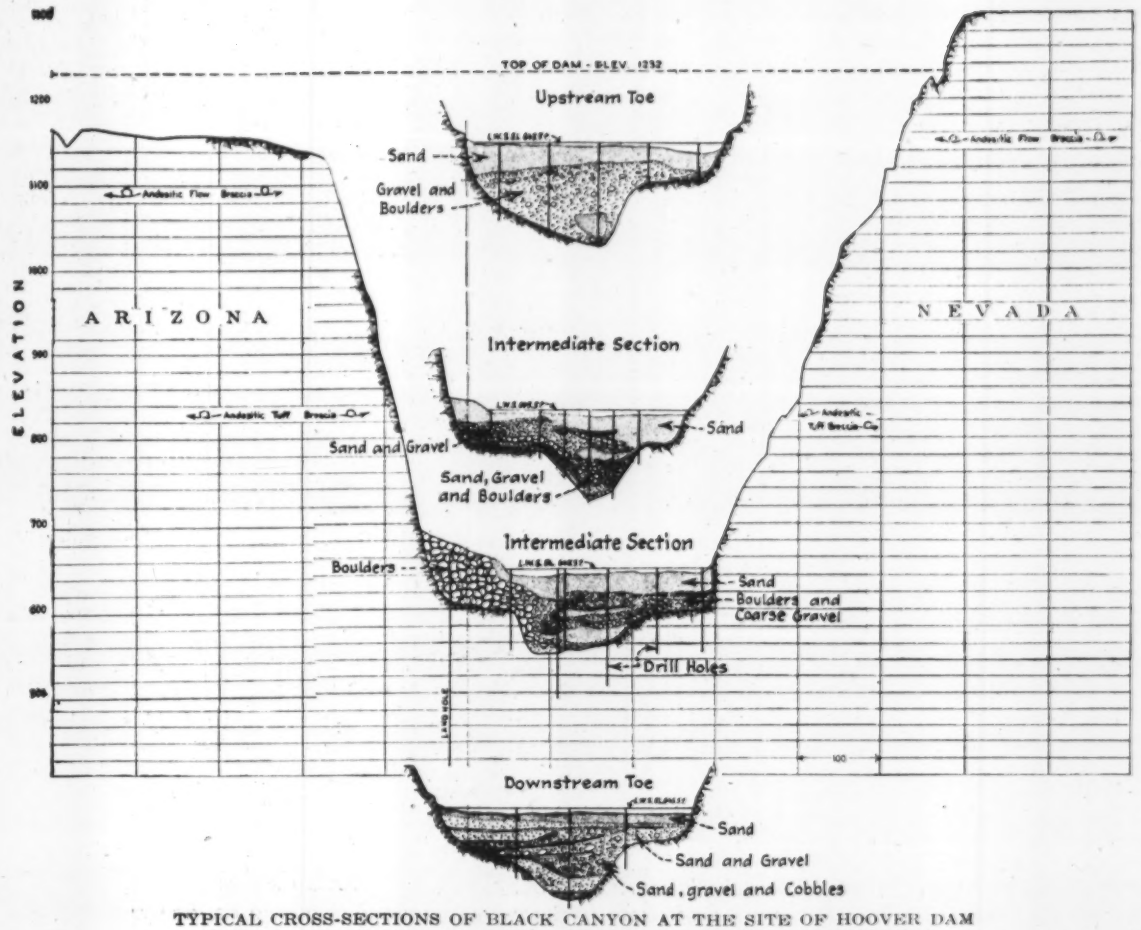
There are few labor restrictions. As is customary on government work, no Mongolian labor may be employed. Preference in employing men is to be given first to ex-service men and second to citizens of the United States. There are no other labor restrictions, and no reference is made whatsoever to maintaining or meeting any wage scale.

A bidding bond of $2,000,000 will be required regardless of the amount of bid, and a surety bond for $5,000,000 will be required, regardless of the amount of contract. The retained percentage of 10 per cent will be withheld from progress payments for the entire duration of the contract.

The time of completion of various units is specified as follows: completion of the power house for six units on side and foundation for remaining units to El. 660, 1,600 days after notice to begin work; completion of the dam to store water to El. 935, 1,965 days; completion of remainder of work, 2,565 calendar days. Liquidated



SPILLWAY DETAILS, PLAN AND ELEVATION OF NEVADA SPILLWAY



TYPICAL CROSS-SECTIONS OF BLACK CANYON AT THE SITE OF HOOVER DAM
Sections of the river bottom are shown at four points along the base of the dam.

damages to the extent of $3,000 will be charged for each day beyond the time limit set taken for each portion of the work as subdivided. The tentative plan schedule for various units, assuming work to start April 1, 1931, is as follows: completion of diversion tunnels, Oct. 1, 1933; cofferdams, May 1, 1934; start placing concrete in dam, Dec. 1, 1934; start water storage, June 15, 1936; start generating power, Sept. 1, 1936, with the water at El. 935; spillway to be completed Nov. 1, 1933. Completion of the spillway may be delayed up to a year's time upon approval of the contracting officer.

Government to Furnish Materials—All materials entering permanently into the construction of the dam will be furnished by the government with the exception of sand and gravel, and these are to be secured from government-owned pits. Thus the government furnishes all cement, reinforcing, rails, wire fabric, rods and bolts, pipe and fittings, conduit lining, copper water stops, all hydraulic machinery, operating machinery, generating equipment, and all materials going into permanent work. This material will be furnished by the government f.o.b. cars at the delivery yard near Boulder City, and the contractor will unload and haul all such materials from the point of delivery to the work, being paid a unit price for such unloading and hauling. The contractor will furnish all sand, broken rock, gravel and cobbles for concrete, sand for grout and sandblasting, gunite, and mortar, and rock for rubble masonry walls, all to be taken from pits owned by the government, no charge being made for these materials by the government. All temporary construction material, such as form lumber, form hardware, temporary timbering in tunnel and shafts, steel liner plates and steel ribs for tunnel supports if required and all other material not going into the permanent construction of the dam will be furnished by the contractor.

The government will set aside a portion of the townsite of Boulder City for use of the contractor as a site for office and headquarters building, dormitories, boarding house and homes for contractor's employees. Plans and type of construction of the buildings to be erected by the contractor and his employees in Boulder City are subject to the approval of the contracting officers. All such buildings must be connected with the water supply and sewerage system installed by the government. For the use of land set aside for the contractor and for the municipal services and utilities made available, the contractor will be charged at the rate of $5,000 per month during the entire period from the date when the water system for the town is first put into operation to the date of final acceptance of the work by the government. In addition, the contractor will be charged monthly for all water used at the rate not to exceed 50c. per 1,000 gal. Electricity for domestic purposes will be made available to the contractor upon request, furnished at rates to be established.

The government has signed a contract with a utility company to deliver electric power not later than June 25, 1931. A readiness-to-serve charge of $17,106 per month plus an energy charge of 6 mills per kilowatt-hour will be made against the contractor for power supply. When power becomes available from the power plant at the dam the government will thereafter serve power to the

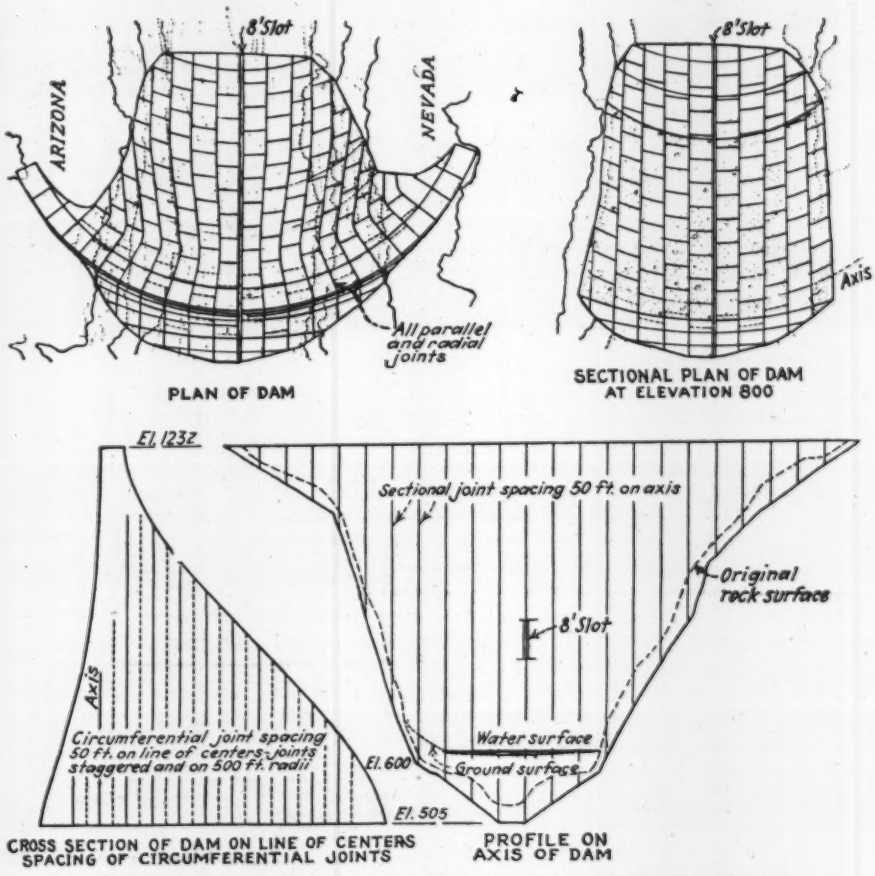
contractor from this plant. Such power will be furnished at a rate of six mills per kilowatt-hour and no readiness-to-serve charge will be made.

Details of Specifications

High-pressure grouting will be required in the tunnels and in the dam foundation. In the tunnels the contractor has the option of drilling grout holes through the completed lining or installing pipes through the forms, so that the end will not be less than 6 in. from the rock, the remaining thickness of the lining and all of the rock to be drilled later. The location, direction, order of drilling and depth of each hole in the tunnel grouting are subject to the contracting officer's direction.

Grout holes are to be drilled in the bottom of the upstream cutoff trench in the dam at about 5-ft. intervals. It is expected that in general the grout holes will be required to be drilled to varying depths up to a maximum of 150 ft.

About 150,000 cu.yd. of loose rock and other materials will have to be scaled off the sides of the canyon before work can begin in the riverbed. The material removed may be disposed of in cofferdams, waste bank or otherwise, in a manner satisfactory to the contracting officer.



ELEVATION AND HORIZONTAL SECTIONS SHOWING CONTRACTION JOINTS

The government has full control over the disposal of waste materials. Excavated material may be placed in the cofferdams or in waste banks designated by the contracting officer, and if such banks are in view of the highway crossing at the top of the dam, they must be roughly smoothed out and made presentable.

All sand, gravel and cobbles for concrete aggregate will be taken from a government-owned pit 8 miles upstream on the Arizona side of the river. After the completion of the cofferdams this pit is liable to flooding at various times and after the beginning of water storage will be flooded permanently. The contractor must arrange to take out enough surplus material and store it above the flood line to keep the work progressing.

Methods of Building the Dam

To provide for expansion and contraction the concrete in the dam is to be built up in blocks or columns about 50x50 ft. in plan. The upstream and downstream vertical faces of these blocks will be curved on the alignment of the dam; the other faces will be parallel to the river channel up to El. 800 (about 300 ft. above foundation), radial above El. 1,100, and warped between 800 and 1,100. Grout pipes will be placed in the vertical joints between the blocks in systems 100 ft. high. The dam will be grouted every 100-ft. lift. No definite proportions have been set for the concrete mixtures. Cobbles up to 9 in. in size will be used along with sand and gravel as aggregates. In general a dry mix (slump not over 3 in.) will be used, designed to give a 28-day strength of 2,500 lb. per sq.in. for the mass concrete and 3,500 lb. for beams, slabs and other reinforced sections. The use of admixtures has not been definitely decided upon.

The time of mixing has been specified as follows for various mixers: 2 yd. and under, 1½ min.; 3 yd., 2 min.; 4 yd., 2½ min.; 5 yd., 2¾ min.; and 6 yd., 3 min. Proportioning of aggregates must be done by weighing, with adjustments available for changes in accordance to moisture content of aggregates, though inundation will not be required. Concrete is to be placed in 5-ft. lifts, but so that not more than 5 ft. in depth is placed in any block in 72 hours, and not over 35 ft. is placed in 30 days.

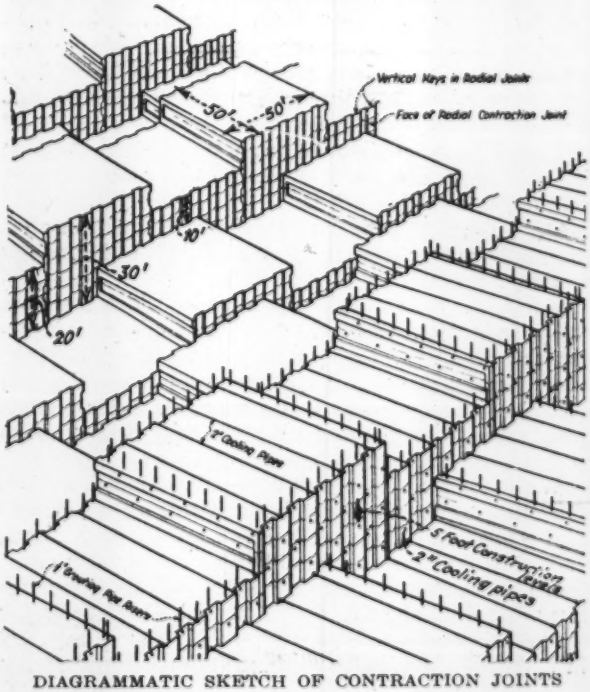
Methods of placing are restricted by the specifications as follows:

> Methods of placing which will deliver concrete of the required consistency shall be used. Placing of the concrete in the dam shall, in general, be done by means of bottomdump buckets or other methods, whereby each complete mixer batch or combination of mixer batches is conveyed in one mass to its location in the dam. Methods of conveying concrete, to any of the structures, by which the mixed batch or combination of batches is progressively loaded into chutes, belts, conveyors or other similar equipment and carried in a thin continuous flow to the forms will not be permitted . . . except by special permission for very limited isolated sections of the work. Dropping the concrete vertically a distance of more than 5 ft. or depositing a large quantity in one place and working it along the forms will not be permitted. All concrete shall be rammed, tamped or worked with suitable appliances until it completely filled the forms or fits snugly against all surfaces. . . . In all tunnels where the concrete lining is of sufficient thickness to permit men to work behind the forms the concrete shall be delivered into the forms at sufficiently close intervals to permit placing in horizontal layers. Methods of placing wherein the concrete within the forms is allowed to flow within the mass, or drops vertically more than 5 ft., will not be permitted; except

that in small tunnels where the lining is not thick enough to permit men to work behind the forms, methods of placing wherein the concrete is delivered at the top of the tunnel sections and flows to place within the forms on a uniform grade will be permitted, subject to the requirement that satisfactory settlement and compacting of the concrete is obtained.

One of the most important features in connection with the concreting of the dam and tunnel plugs is the installation and operation of a cooling system to dissipate the heat generated by the setting of the concrete. This system consists of about 800,000 lin.ft. of 2-in. standard pipe and fittings, the pipe loops being connected in series up to total lengths of 1,600 ft. Pipe and fittings will be furnished by the government but must be installed by the contractor, who also furnishes and operates the cooling plant. The cooling plant must have a capacity sufficient to reduce from 47 to 40 deg. F. the temperature of a flow of 2,100 gal. of water per minute. Water may leave the embedded pipes at any temperature between 42 and 65 deg., and the quantity of cooling water may vary from 350 to 2,100 gal. per minute, but the temperature of the cooling water entering the embedded pipes shall in no case be lower than 35 deg. The average temperature rise due to setting of concrete is stated to be approximately 40 deg. above placing temperature. The amount of heat to be removed is approximately 700 B.t.u. per cubic yard of concrete. The specifications further state that the velocity of water in the cooling pipes shall be not less than 2 ft. per second. Arrangements shall be made to reverse the flow in the pipe loops if desired by the contracting officer. The method of applying the cooling water shall be such that the pressures in the pipes shall not exceed 100 lb. per sq.in. Cooling water shall be applied until the mean temperature of the concrete around each embedded pipe is reduced to 72 deg., as shown by embedded thermometers which the contractor must install for the government. The cost of installing the pipes and installing and operating the cooling system is covered in a lump-sum bid item.

Metal or metal-faced forms will be required for the main body of the dam and the concrete linings of tunnels, adits and shafts, where the forms are to be used more than once. Unfaced wooden forms may be used more than once in certain places in the dam, subject to the approval of the contracting officer. Metal rods or other form holders must be cut off at least 2 in. within the face of concrete, and wire ties are not permitted except by special permission.



DIAGRAMMATIC SKETCH OF CONTRACTION JOINTS

No permanent timber will be permitted in the tunnels. Where necessary to provide permanent support within the tunnels steel ribs or liner plates will be required.

The entire upstream face of the dam up to the coping, the outside surface of intake towers and the upstream face of all tunnel plugs in the inner diversion tunnels will be surfaced with gunite having a total thickness of 1 in. The gunite shall be continuous without construction joints, applied in continuous sheets for the full length of sections in lifts approximately equal in height to lifts for concrete. One special provision in connection with guniting is that the gunite shall be applied by workmen who have been employed on at least two other similar jobs. In applying the gunite, air pressure of not less than 35 lb. per sq.in. and water pressure of not less than 50 lb. per sq.in. shall be used.

The Hoover Dam will be built by the U. S. Bureau of Reclamation, under the direction of Elwood Mead, commissioner of reclamation. Raymond F. Walter is chief engineer of the bureau; John L. Savage is chief designing engineer; and Walker R. Young is construction engineer. Drawings reproduced in this article are from those prepared by the bureau.

Sampling for Suspended Sediment

A COMPREHENSIVE study of the sediment carried by the Mississippi River system is now being conducted by the waterways experiment station at Vicksburg. Sediment in motion is followed from the headwaters to the Gulf. Observation stations are located on all controlling tributaries and at strategic points on the main river. The methods utilized to get a true sample are described by T. W. Wood, junior engineer of the Vicksburg station, in a recent issue of *The Echo*, bulletin of the Memphis Engineer District, as follows:

Several types of field equipment are in use for this purpose. One consists of a corked bottle, weighted and lowered to the desired depth, then allowed to fill by pulling a string tied to the stopper. Another consists of an ordinary milk bottle sealed with a waxed bottle cap; at the desired depth a weight sliding on the suspending cable is released, striking a knife edge held by springs above the bottle and thus perforating the cap. Both of these devices are highly satisfactory but suited only to the smaller and shallower streams. On the main river the standard Mississippi River Commission sampler is used; it is rugged, easy to handle, and dependable. The sampler consists of an iron pipe fitted with flutter valves on both ends and suspended from one end by a flexible steel cable. Weights attached to the sides of the pipe hold it in a nearly vertical position as it descends through the water. The apparatus is used from a boat and the cable is played out from a calibrated drum as the boat drifts downstream with the current. A resultant motion vertically downward is obtained, the pressure of water opens the flutter valves, and free flow through the pipe is obtained. At the proper depth the motion of the pipe is suddenly checked, the valves close by their own inertia and are held closed by the reversed pressure as the sampler is pulled to the surface.

Engineering Literature

A Monthly Review of Books and a Listing of New Publications

Timoshenko on Strength of Materials

REVIEWED BY C. J. TILDEN
Strathcona Professor of Engineering Mechanics, Yale University, New Haven, Conn.

STRENGTH OF MATERIALS—By S. Timoshenko, Professor of Engineering Mechanics, University of Michigan. Part I: Elementary Theory and Problems. New York: D. Van Nostrand Co., Inc. Cloth, 6x9 in.; pp. 368; text illustrations. $3.50. Part II: Advanced Theory and Problems. Cloth; 6x9 in.; pp. 735; text illustrations. $4.50.

THE IDEAL textbook in strength of materials may never be written. It should unite the purely mathematical treatment of the subject with practical engineering considerations, so as to give the student a clear and well-composed picture of that combination of theory and practice which is the most important factor in the problem of engineering design. But just what is the proper emphasis on each of these two divisions? This depends to so great an extent on the individual teacher, his professional background, intellectual interests and methods of teaching that it is doubtful if the universal text will ever be produced.

In the exhaustive work which Professor Timoshenko has written there are two outstanding characteristics. He puts the emphasis on the mathematical side of the subject, and shows an equally strong predilection for the work of foreign investigators. These are given full credit in frequent footnotes referring the reader to original sources. The 700 pages of text are divided into an "elementary" volume and an "advanced" volume, the one intended for undergraduate and the other for graduate students. This arrangement not only has many advantages in presenting the subject as usually taught in modern technical schools but gives added value as a reference work for any who studied it in college.

In the elementary volume there is material for a decidedly stiff course extending throughout the school year. There are ten chapters covering tension and compression, combined stresses, torsion, stresses in beams, deflection of beams, statically indeterminate problems in bending, bending "beyond the yield point," and beams "of two materials" (reinforced concrete), direct and bending loads, combined bending and twist, and energy of strain. Whether some of these—for example, the statically indeterminate problems and the discussion of elastic strain energy—may advantageously be included in the customary introductory course is questionable. In general the topics are clearly presented, although the diction does not always flow smoothly, and at times the treatment would appear to offer some difficulties for the average undergraduate. It is doubtful if an engineering student in his sophomore year could master the presentation of the "Mohr circle" (p. 50) without considerable help from the instructor. In this instance, as in some other places, the diagrams do not give so much assistance as they might if they had been more intelligently and carefully drawn. In several of the bending moment diagrams (pp. 119, 153, 179, etc.), the parabolas seem to have been drawn with a pair of compasses—a bad example to set an engineering student.

Documenting by footnotes which refer the reader to original sources is an excellent feature conscientiously done. It gives the student an illuminating idea of the extent of the labors of investigators in this field. One or two omissions, however, should be noted. Fig. 58, p. 76, should be credited to Prof. Karl Bach, in whose "Elastizität und Festigkeit" it was first published. The effect of this original work of Bach's was stimulating and far reaching. An even more surprising omission is the failure to give credit to Prof. Charles E. Greene, formerly dean of engineering at the University of Michigan, for the area moment method of discussing the deflection of beams, or, as Professor Timoshenko calls it, "the determination of deflections by use of the bending moment diagram." Professor Greene first presented this method in print in 1874, but for some reason has failed to get the recognition which is his due for a remarkable and valuable contribution to the theory of beam analysis.

In the second volume the author discusses some of the more complicated problems concerning beams, curved bars (including the two-hinged arch and the rotating flywheel), the buckling of bars, plates and shells, and some of the recent investigations of stress concentration and distribution by means of models and the photo-elastic method. There is a final chapter on the mechanical properties of material, discussing tension and compression tests, types of failures, fatigue, the effect of high temperatures, and, finally, working stresses.

Technical Activities of the Ancients

THE TECHNICAL ARTS AND SCIENCES OF THE ANCIENTS—By Alfred Neuburger. Translated by Henry L. Brose, M.A., D.Phil.(Oxon.). (Originally published in German as Die Technik des Altertums. New York: The Macmillan Co. Cloth; 7x10 in.; pp. xxxii + 518; 676 halftones and line cuts. $10.

MORE than twenty years, the translator tells us, were taken by the author to "collect and shift" . . . "the facts he considered necessary for an adequate survey of the manifold technical activities of the ancients." The periods covered range from the various dates at which records are available for the different countries, well down toward 500 A.D.

Once through with his significant introductory remarks, the author takes up mining, metal working, woodworking, preparation of leather, agriculture, fermentation and many other main topics, under which there are many sub-topics. Subjects not yet mentioned of particular interest to engineers include machines, lighting, heating, town planning, fortifications, private and public edifices, building methods and material, water supply, sewers, irrigation and drainage, roads and bridges, ships and shipbuilding, navigation and harbors.

With scores of topics and reviews by countries, much condensation was necessary, but as a rule a good general idea is given of the various technical arts of the ancients, extending through a millennium or two in many cases. The subject matter presented under each head is much like what would be found in a general encyclopedia for the periods here covered, but as a rule it is more extended in text and still more so in illustrations. Added to this

is the advantage of its having been written by one man, in accordance with a single well-made plan.

The volume should have a wide appeal both to those directly concerned with the subjects treated and to the general reader. The nearly 700 illustrations tell a series of wonderful stories.

British Engineering Practice Summarized

REVIEWED BY ARTHUR M. GREENE

Dean of School of Engineering and Professor of Mechanical Engineering, Princeton University, Princeton, N. J.

THE ENGINEER'S YEAR BOOK of Formulae, Rules, Tables, Data and Memoranda for 1930: A Compendium of the Modern Practice of Civil, Mechanical, Electrical, Marine, Gas, Aero, Mine and Metallurgical Engineering. (Originally compiled by H. R. Kempe, M.Inst.C.E., M.I.Mech.E., and W. Hanneford Smith, Assoc.Inst.C.E.). 37th annual issue revised under the direction of the Editor of *The Engineer*. London: *The Engineer*, with Crosby, Lockwood & Son as trade agents. Flexible; 5x7 in.; pp. 2,997, including advertisements and Classified Directory and Buyer's Guide; illustrated. 31½s. in Great Britain.

THIS enormous handbook covers a wide list of subjects, which it treats in 47 sections, each dealing with some special phase of engineering and written by an authority. The list of more than 70 associate editors and contributors is made up largely of members of the British engineering societies.

To one who is accustomed to use American engineering handbooks the absence of certain tables is greatly deplored. Tables of logarithms, trigonometric functions, powers, roots, areas, circumferences and similar tables are not found. There is also an absence of certain theoretical data and formulas which we find in our handbooks.

The book appears to be one in which the products of different firms are discussed in the proper sections of the book, and at these points the theory required for that apparatus is given in its final form, although derivations are rarely given. In this way the text gives many more diagrams than our American handbooks. The figures and texts are applicable to American practice in some cases, but in others the practice is applicable only to British plants and climate.

Although published at frequent intervals, many parts of the book are not brought up to date. For instance, under hydraulic power no recent stations are shown and there are no cuts showing the propeller turbine of high specific speed. Under concrete there is no mention of the slump test for consistency or of the mixture and water content for a desired strength. Under cost of engineering work, costs are given in pre-war prices and no mention is made of recent prices with machines. The costs of three small bridges of recent years are given. There is no indication of the cost of recent large bridges.

As mentioned above formulas fitting definite devices are given in the section in which those devices are described and as a result formulas naturally occurring in a single portion of the handbook are distributed through several sections. As an example, hydraulic formulas are scattered through five sections of the book. This may be done for a purpose by the editor, but to one accustomed to find formulas developed in a small section of a handbook, the scattering seems objectionable.

The great value of the book is in the practical data and figures illustrating the work of many British firms. Interspersed also throughout the book, as well as at the front and back, are pages advertising some engineering or industrial product. An index under subject headings gives firm names manufacturing this product, and the index of firm names gives the location of the advertising page of this firm. These pages occur through the book at appropriate places, but their presence is not helpful to the reader who is looking for technical information.

The book is profusely illustrated with halftones and line cuts, but most of these quite profusely illustrate British practice, as has been stated earlier. The parts of the book not dealing with fundamentals would have little value for the American engineer. The first sections of the book deal with structures, then traction and manufacturing. These are followed by power transmission, machine design, refrigeration and sanitary engineering. Next come metering fluids, harbors and navigable waterways. Then follow steam engineering, internal combustion engineering, fuels, naval architecture and marine engineering, gas works, heating, ventilation, lighting, fire protection, and mining and metallurgy. The last sections are devoted to explosives, workshop receipts, radio, costs, depreciation and legal notes.

The completeness of the book necessitates the use of more than 3,000 pages. It appears to the reviewer that a separation of the book into two parts would be advantageous to the user of this valuable reference book. I know of no single book in which the vast fields of engineering are treated with so much fullness of application.

As a record of British practice the book has a particular value to the American engineer, although the various sections do not give the most recent practice.

Water Action on Concrete Dams in Norway

DEN NORSKE INGENIORFORENINGS BETONKOMITE: Meddelelse Nr. 1—Undersokelse av Skader pa Vare Betongdammer og Bruddstendsdammer i Mortel Arsak og Botemidler. Oslo, Norway: Den Norske Ingeniorforening. Paper; 7x10 in.; pp. 261; 121 line cuts and halftones.

REVIEWED BY ODD ALBERT

Structural Engineer, East Orange, N. J.
Formerly Professor of Mathematics at West College, Sweden

TO ASCERTAIN how dams of concrete are affected by water action when under hydraulic pressure, the Norwegian Society of Engineers in Oslo made a thorough examination of 88 of the more important concrete dams in Norway—some more than 30 years old. These investigations were started in the summer of 1926, and this is the committee's first report, dated July, 1930.

It was found that very few of the dams were uninjured and that the injuries were not evenly distributed over the dams, thus showing that the proportions of the concrete mixture must have varied during construction. Most of the injuries were located at the joints. Organic matter, iron and manganese substances were accumulated on the injured parts. Though none of the dams was found to be very seriously damaged, the committee advised that the injuries be repaired.

The main cause of the injuries is said to be the chemical action of the water. Thus the water will penetrate cracks caused by temperature changes and frost and start to remove soluble parts of the concrete. The floodwater is known to be more or less acid and is therefore lime dissolving. The concrete mixture was determined in most cases to be not rich enough, and it is pointed out that sooner or later a concrete structure under hydraulic pressure would be completely destroyed by this acid water.

The report suggests the use of membranous waterproofing as a protection against temperature cracks, but no means has been found to protect this layer against the mechanical work of the water. The most interesting proposal is to place a thin watertight concrete slab in

front of the dam, with an air space between the slab and the dam. This construction was used for the Ringedal dam—33 m. (107 ft.) high. The slab was 20 cm. (7.85 in.) thick at the top and 47 cm. thick at the bottom. The air space between the slab and the dam was 2 m. The slab was supported by columns with spiral reinforcing. The horizontal spacing of the columns was 2.25 m. and the vertical spacing varied from 3 m. at the top to 1.80 m. at the bottom.

A Helper in Piping Problems

REVIEWED BY CALEB MILLS SAVILLE

Manager and Chief Engineer, Water Bureau, Metropolitan (Hartford, Conn.) District

PIPING HANDBOOK—By J. H. Walker, M.Am. Soc.M.E., M.Am. Soc.H.&V.E., Superintendent of Central Heating, Detroit Edison Co., and Sabin Crocker, M.Am.Soc.M.E., M.A.S.A. Sectional Committee on Standardization of Pipe Flanges and Fittings, Engineer, Detroit Edison Co., with contributions by others. New York and London: McGraw-Hill Book Co., Inc. Flexible; 5x7 in.; pp. 763; tables and text illustrations. $5.

IN THE earlier days, when there were engineering giants in the land and before the time when so many persons found it necessary to break into print, a notebook, kept by a master of engineering, usually contained within its covers more information of real value than is now included in scores of so-called special treatises. Of this notebook class is the "Piping Handbook." It is just what it purports to be: a helper in piping problems, no more, or less, and yet it seems to cover the whole field from elementary formulas to advanced metallurgy and high-temperature heat transmission, with side lines to the practical application of the intricacies of transportation of oil, gas and water.

Even in the small plants, and particularly in those, the operator, who is often a whole organization from superintendent to office boy, will find an answer to those present-day problems pertaining to piping which modern progress is forcing upon him. As well, the up-to-date designing engineer will here find facts and information which will enable him to turn out a more efficient and economical plant.

Of the fifteen chapters, five have been contributed by engineers of acknowledged repute in their specialties: L. B. McMillan on heat insulation, Arthur McCutchan on expansion and flexibility, George H. Fenkell on water-supply piping, Leslie D. Burritt on oil piping, and Frank W. Stern on gas piping. The remainder of the book has been assembled and coordinated by the authors, with the able assistance of many engineers of the Detroit Edison and other companies, and is apparently a garnering of the fruits from many notebooks as well as from other sources.

After definitions, formulas and tables of general application there are chapters on fluids, metallurgy and pipe appurtenances, in language intelligible to busy men. Then come chapters on insulation, supports and flexibility, including expansion. The last half of the book takes up steam power, heating, plumbing, underground steam work, water supply, fire protection and the transmission of oil and gas.

The book should be of particular value to water-works engineers and operators, not only for Mr. Fenkell's chapter on water supply but also for the other chapters, all of which deal with the more or less common problems of water-plant operation. Besides its appeal to engineers engaged in water, oil and gas engineering, the book should have a wide sale to architects and plumbers.

German Cement Makers and Dealers

ADDRESSBUCH der Zement, Kalk, Gips Industrie—Charlottenburg 2, Germany: Bau-Kurier. Cloth; 6x9 in.; pp. 301; halftone views. 15 marks.

GERMANY is noted for its many cement plants and many kinds of cements (portland, hochwertig-portland, super-portland, eisen-portland, hochofen-portland, etc.) and for various other kinds of binders or cementing materials. Almost all cement companies, as well as lime and gypsum manufacturers, belong to cartels or syndicates which sell the product of member companies, prorating shipments from each mill on a predetermined basis. There are three such cartels for the portland cement manufacturers, the North German, the South German and the West German syndicates.

Besides various commercial and technical syndicates and societies of the cement, lime, gypsum, sand and stone companies, this directory lists the manufacturing companies and gives a brief description of the plants with their location, banking connections, financial set-up and output. Pictures of the plants are shown. An alphabetical listing of the officials of the different companies is given; also a rather complete list of the cement companies of the world, with the location of their plants and principal offices.

Many Data on Silting

SILTING OF RESERVOIRS—By T. U. Taylor, M.C.E., Professor of Civil Engineering, Dean of the College of Engineering, University of Texas, Austin. Paper; 6x9 in.; pp. 170; line cuts and halftones.

DEAN TAYLOR, well known for his long series of studies of silting behind the old and new dams at Austin, Tex., has here brought together not only a summary of his various observations at that locality but also data on silting behind many other dams built across turbid streams in the southwestern and central United States. A few pages of general discussion and of notes on silt survey methods open the bulletin. Besides Lake Austin and other Texas reservoirs, some in New Mexico and one each in Wyoming and Tennessee are considered, as also silting behind the Keokuk (Iowa-Illinois) dam. A chapter is devoted to silting problems on the Colorado River of the West; another to silting behind "water dams," or setbacks in tributaries above their junction with rivers or lakes. The concluding chapter (14 pp.) is on desilting of reservoirs and canals, the former chiefly by sluicing; the latter by dredging. There is a brief bibliography.

A Masterly Picture

AMERICAN INDUSTRY AND COMMERCE—By Edward Dana Durand, Statistical Assistant to the Secretary of Commerce and Former Director of the U. S. Bureau of the Census. Boston: Ginn & Co. Cloth; 6x8½ in.; pp. ix-xviii and 3-653; line cuts and tables. $4.

MR. DURAND'S aim was "to present a general picture of American industry and commerce." This he has done in a masterly way with reliance upon interesting text and the graphical rather than the tabular method of showing growth. Chief attention is given to the nineteenth and present centuries, with emphasis upon the latter. Opening chapters deal with income and standards of living, economic progress, population and natural researches, and such secondary factors of growth as education, research, the attitude of labor, use of capital and use of power. Occupations and economic geography, basic industries — agriculture, mining, manufactures, transportation—and, finally, foreign trade are considered

in succession. A comprehensive index is provided. A vast amount of information is presented in easily grasped form.

To Assist Trade With Great Britain

THE UNITED KINGDOM: British Industry and Commerce—An Industrial, Commercial and Financial Handbook by Hugh Butler, American Trade Commissioner in London, and officials of the U. S. Departments of Commerce and State. Cloth; 6x9 in.; pp. 953; maps, charts and bibliography. $1.75 from the Superintendent of Documents, Washington, D. C.

DESPITE the employment of a common tongue by the two leading countries in the industrial world, American industry has labored under the disadvantage of a lack of understanding of British commercial methods. This lack is made good by this volume of statistical and other information on industry and commerce in the British Isles. In readable form is given a picture of conditions under which each commodity is produced, supplemented by data on a host of related subjects, such as overseas trade and transportation facilities, a complete survey of British financial and insurance methods, and classified information on inter-empire and international commerce.

Publications Received

FIRES IN WOODEN AIRPLANE HANGARS may be controlled by automatic sprinkler systems, according to a 42-p. illustrated committee report prepared by the aeronautics branch of the Department of Commerce. 15c. from superintendent of documents, Washington, D. C.

THE INDUSTRIAL MUSEUM OF NEW YORK has started publication of a bulletin. The first number is devoted to an exhibit of early astronomical and mathematical instruments and the second to an address by Billings Wilson on the development of transportation in the port of New York district, delivered in May, 1930, in the Engineering Societies auditorium, New York City.

ELECTRO-PNEUMATIC INTERLOCKING AND ELECTRIC RECTIFIERS are the titles of two pamphlets issued by the signal section of the American Railway Association (30 Vesey St., New York) to form chapters 9 and 18 of its treatise on "American Railway Signals and Signaling." The one on rectifiers includes the fundamental theory of alternating currents. Twelve chapters have now been published separately (25c. each to railway employees and 35c. to others).

TWO CHAPTERS in a book on "Industrial Microbiology," by H. F. Smyth, assistant professor of industrial hygiene, University of Pennsylvania, and W. L. Obold, assistant professor of biological sciences, Drexel Institute, are of special interest to sanitary engineers. One is on gas production in sewage-treatment plants and the other is a brief statement relating to bacterial behavior under refrigeration. To the industrial chemist and engineer the whole book will be an asset, since it shows the growing importance of microbiological processes in industry. In the 313 pp. are a dozen chapters on carboxylic acids, alcohols, glue and gelatin, leather and hides, textiles, sugars, yeasts, vegetable oils, fertilizers, thermogenic fermentation, foods, coal, petroleum and phenols, latex and enzyme production. ($6, from Williams & Wilkins, Baltimore, Md.)

THE FIRST NUMBER of *Mitteilungen des Instituts für Strömungsmaschinen*, a publication sponsored by the Hydraulic Turbine Institute of the Karlsruhe Technical College, contains a short description of the institute and its laboratory equipment and three technical papers: one describing a purely theoretical investigation and two describing in detail experiments on rotating hydraulic machinery. The first paper is a theoretical study of the distribution of pressures in water passing through a turbine. The second gives the results of experiments to determine the action of gates and runners in altering the direction of flow. The third paper describes an instrument used at the institute to investigate the distribution of pressures over the faces of turbine gates. The journal named is published at 8 marks an issue by R. Oldenbourg, Munich and Berlin, Germany.

THE TAXATION SYSTEM of the United States and of 28 of its component states is exhibited in tabular form in a paper-bound folio volume prepared under the direction of the New York state tax commission (Albany, N. Y.), copyrighted by the National Tax Foundation and put on the market as stated below. Besides the exhibit of the tax system of our federal and state governments, the volume contains a tabular summary of the status of certain tax matters of the various states, Jan. 1, 1930, including tax commissions, general property taxation, motor vehicle license laws, public utilities, taxation of corporations, special assessments, income tax laws and the like. It is expected that later annual issues will cover all the states in the Union and that sooner or later taxation in all the countries of the world will be exhibited. ($5 from the Commerce Clearing House, 120 Broadway, New York City.)

THE SENTINELS OF WATER LONDON (service reservoirs) is the subject of Sir Alexander Houston's travelogue in his 24th annual report as director of water examinations, Metropolitan Water Board (98 pp., folio, besides many plates containing 65 fine halftone views). The volume contains the usual detailed results of chemical and bacterial examinations of the water supplied from various sources to the millions of people within "Water London," accompanied by interesting and suggestive explanatory text. Raw, prefiltered, filtered and chlorinated water are dealt with. The 93 service reservoirs have a total capacity of 338,000,000 gal. (U. S. standard). They are scattered over "Water London," as shown by sectional maps in the report. From their roofs may be seen much of historic, literary and landscape interest—as pointed out in the 40 pp. of text which precedes the views. This year's travelogue is one of a series which has become a distinctive feature of Dr. Houston's annual reports. (21s., from P. S. King & Son, Ltd., 2 Great Smith St., Westminster, England.)

A YEAR'S RESULTS IN CITY PLANNING in Los Angeles are given in an attractive 76-p., 8½x11-in. report for the year ended June, 1930, by the local city planning commission, headed until recently by D. M. Baker, a consulting engineer. Results during the year are epoch making (see *Engineering News-Record*, Dec. 4, p. 891). A new zoning ordinance based on ten years' experience making a great step in zoning administration and procedure in Los Angeles, a definite ordinance on subdivision platting, mass transportation studies by a combination of all official agencies involved, downtown zoning to protect against a threatened influx of light industries, are typical activities. In addition to the reports of department heads is a paper by Mr. Baker, summing up the city's problems and calling strenuously for fact finding and research "to create a proper city plan and to obtain for the citizen the highest social efficiency." Of striking interest is a chart showing the exorbitant increase in ratio of lots to population since 1920. More than one-half the lots in the county are vacant. The results of overzoning for business and decrease in single resident family capacities are covered.

New Books and Revised Editions

[*Those desiring copies of the books listed below or mentioned elsewhere in this section should order them from the publishers or from their local booksellers.*]

AIRPORTS: Their Location, Administration and Legal Basis—By Henry V. Hubbard, Miller McClintock and Frank B. Williams, Assisted by Paul Mahoney and Howard K. Menhinick. [Harvard City Planning Studies, Vol. 1.] Cambridge: Harvard University Press. London: Humphrey Milford. Cloth; 7x10 in.; pp. 190; halftones, tables and line cuts. $3.50.

THE AMERICAN LEVIATHAN: The Republic in the Machine Age—By Charles A. Beard, Sometime President of the American Political Science Association, and William Beard, B.S., Massachusetts Institute of Technology. New York: The Macmillan Co. Cloth; 6x9 in.; pp. 824; halftones. $5.

THE ATLANTIC—By Stanley Rogers. New York: Thomas Y. Crowell Co. Illustrations; cloth; 6x9 in. $2.75.

A readable popular book on the Atlantic in general, the history of navigation upon it and over it, including "freak" vessels, "solo" passages and the most notable flights across it.

BOUNDARIES, AREAS, GEOGRAPHIC CENTERS, and Altitudes of the United States and the Several States, with a Brief Record of Important Changes in Their Territory and Government—By Edward M. Douglas. Second Edition. Geological Survey Bull. 817. Paper; 6x9 in.; pp. 265; halftones, tables and maps. 50c.

Parts of this bulletin are interesting to read and all of it is useful for reference. The altitudes are confined to extreme and mean of the several states and principal possessions and to the extremes of the continents.

BUILDING RESEARCH BOARD (British): Report for 1929—London: H. M. Stationery Office. New York: British Library of Information, 5 East 45th St., New York City. Paper; 6x9 in.; pp. 121; line cuts and halftones. 2½s.

Reflects the wide scope and usefulness of the research work being done by this body, whose staff on Dec. 31, 1929, numbered 133. Describes diverse tests on a wide variety of building materials and in addition such special investigations as studies of vibration, wind pressures, earth pressures, building efficiency from the user's viewpoint, and acoustics.

FURTHER EXPERIMENTS ON THE DISCHARGE OF MODELS OF SLUICES—By H. E. Hurst, M.A., D.Sc., F.Inst.P. Director-General, Physical Department, Egyptian Ministry of Public Works. Boards; 7x11 in.; pp. 39; halftones, tables and line cuts. 10 piasters from Ministry of Finance, Cairo, Egypt.

COMPRESSIVE TESTS OF BASES OF SUBWAY COLUMNS—By James H. Edwards, H. L. Whittemore and A. H. Stang. Reprint from Bureau of Standards *Journal of Research*, September, 1930. Paper; 6x9 in.; pp. 8; illustrated. 10c. from Superintendent of Documents, Washington, D. C.

Tests initiated by the late James H. Edwards, chief engineer of the American Bridge Co., in the belief that welded fabrication for column bases of subway bents would be more satisfactory than the customary riveted bases. Tests were made of three welded bases (consisting of one bottom plate and two wing plates), three riveted bases without base plates (requiring six angles and two plates) and three riveted bases with base plates (requiring six angles and three plates). The strength of the welded specimens and the riveted specimens having base plates was practically the same. The strength of the riveted specimens without base plates was about 60 per cent of the strength of the other types.

ELEMENTS OF SURVEYING—By Raymond E. Davis, M.S., C.E., Professor of Civil Engineering, University of California, Francis S. Foote, E.M., Professor of Railroad Engineering, University of California, W. H. Rayner, M.S., C.E., Assistant Professor of Surveying, University of Illinois. New York and London: McGraw-Hill Book Co. Flexible; 5x8 in.; pp. 581; tables and line cuts. $4.

THE GOVERNMENT OF METROPOLITAN AREAS IN THE UNITED STATES—Prepared by Paul Studenski with the Assistance of the Committee on Metropolitan Government of the National Municipal League. New York: National Municipal League, 261 Broadway. Cloth; 6x9 in.; pp. 403; $3.50.

HYDRAULICS: For Engineers and Engineering Students—By Frederick Charles Lea, D.Sc. (Engineering, London), M.Inst. C.E., M.I.Mech.E., Professor of Mechanical Engineering in the University of Sheffield. New York: Longmans Green & Co. London: Edward Arnold & Co. Cloth; 6x9 in.; pp. 775; halftones, tables and many line cuts. $7.50.

NATIONAL ASPECTS OF WATER POWER DEVELOPMENT: A Review of the Facts—By the National Water Policies Committee. Washington, D. C.: Chamber of Commerce of the United States. Paper; 8x10 in.; tables and line cuts. $1.

POPULATION [Lectures on the Harris Foundation, 1929]—By Corrado Gini, President of the Central Statistical Bureau, Rome, Italy; Shiroshi Nasu, Professor of Rural Economics, Imperial University of Tokyo, Japan; Robert R. Kuczyriski, Council Member, Institute of Economics, Washington, D. C.; Oliver E. Baker, Economic Geographer, Bureau of Agricultural Economics, Department of Agriculture, Washington, D. C. Chicago: University of Chicago Press. Cloth; 5x8 in.; pp. 312; tables and many line cuts. $3.

RAHMENTAFELN—Von Dr. Fukuhei Takabeya, Professor an der Kaiserlichen Hokkaido-Universität Sappora, Japan. Berlin: Julius Springer. Paper; 7x10 in.; pp. 117; 186 diagrams. 16 marks in paper, 17 marks bound.

SCHUTZ DER BAUWERKE Gegen Chemische und Physikalische Angriffe—Herausgegeben von Otto Graf, Professor für Baustoffkunde und Baustoffprüsung an der Technischen Hochschule Stuttgart, und Hermann Goebel, Dipl.-Ing., Oberingenieur der Farbenindustrie Aktiengesellschaft, Ludwigshafen a. Rh.; under Mitwirkung von Otto Dewald [and others at the works named]. Berlin: Wilhelm Ernst & Sohn. Paper; 7x10 in.; pp. 224; 243 line cuts and halftones. 20 marks in paper, 22 bound.

SOVIET-UNION YEAR-BOOK, 1930—Sixth Annual Issue. Compiled and Edited by A. A. Santalov and Louis Segal, Ph.D., M.A. Cloth; 5x7 in.; pp. 670; folding maps and many tables. $2.50 from Amtorg Book Department, 19 West 27th St., New York City.

A comprehensive summary of the political organization, economic development, agricultural and other industries, concessions, cooperative movement, transport, trade, finance, etc., of U.S.S.R. Contains new sections on health, patent laws and rights of foreigners. Outlines program on five-year development plan.

STANDARDS AND SPECIFICATIONS for Non-metallic Minerals and Their Products, 1930—Prepared by John Q. Cannon, Jr., Under the Direction of A. S. McAllister, Chief of the Division of Specifications, National Bureau of Standards. Cloth; 8x11 in.; pp. 680; tables and line cuts. $2.75 from Superintendent of Documents, Washington, D. C.

Gives "substance of the standards and specifications [as indicated above] formulated by the national technical societies, the trade associations having national recognition, or other organizations which speak for industry or with the authority of the Federal Government as a whole." A corresponding volume on the wood-using industries was published in 1927.

STANDARDS FOR MODERN PUBLIC UTILITY FRANCHISES—By John Bauer, Ph.D., Director, American Public Utilities Bureau. New York: Municipal Administration Service, 261 Broadway. Paper; 7x10 in.; pp. 36. 25c.

Considers local franchises "in relation to the established principles and methods of state regulation, and the basic conditions which should be embodied in the franchises themselves." Study is projected, comparing "provisions included in the more important franchises granted during recent years."

STRESSES DUE TO THE PRESSURE OF ONE ELASTIC SOLID UPON ANOTHER—A Report of an Investigation Conducted by the Engineering Experiment Station, University of Illinois, in Co-operation with the Utilities Research Commission—By Howard R. Thomas and Victor A. Hoersch. Urbana: University of Illinois. Paper; 6x9 in.; pp. 56; tables and line cuts. 30c.

STREET CLEANING AND REFUSE DISPOSAL, Further Studies of European Methods of, with Suggestions for New York—By George A. Soper, Ph.D., M.Am.Soc.C.E. Report to the Committee of Twenty on Street and Outdoor Cleanliness, Appointed by the New York Academy of Medicine, New York, 2 East 103d St. Stiff paper; 6x9 in.; halftones.

A second report by Dr. Soper, who says: "The immediate objects of the trip were to attend an international congress of municipal cleansing authorities at Stuttgart and an international hygienic congress at Dresden, to inspect the large modernized refuse incinerator at Zurich, and to see how the people of Italy were handling the question of city cleansing."

UBER DAS ELASTISCHE VERHALTEN VON BETON mit besonderer Berücksichtigung der Querdehnung—Von Hirohiko Yoshida, Professor am Technical College in Fukui, Japan. Berlin: Julius Springer. Paper; 6x10 in.; pp. 114; halftones and line cuts. 11 marks.

WIND PRESSURE ON CIRCULAR CYLINDERS AND CHIMNEYS—By Hugh L. Dryden and George C. Hill. Reprint from Bureau of Standards *Journal of Research*, September, 1930. Paper; 6x9 in.; pp. 41; illustrated. 15c. from Superintendent of Documents, Washington, D. C.

Information on various tests of chimneys, model and actual, analyzed to compare wind pressures with wind velocities. Indicates that the pressure is a function of the ratio of height to diameter and possibly of the roughness of the surface; that model experiments cannot be directly utilized for this work; that a pressure corresponding to 20 lb. per sq.ft. of projected area at a wind speed of 100 miles per hour is a safe value to use in designing chimneys of which the exposed height does not exceed ten times the diameter; and that pressures may reach large values locally.

Letters to the Editor

More on Cinders and Sulphur

Sir—The letter of M. E. Capouch concerning cinder concrete, published in your issue of Nov. 6 on p. 739, was read with interest.

In 1909 the floor of a highway bridge 1,548 ft. long over the Allegheny River was paved with wood block with a cinder concrete base carried on steel buckle plates. Cinders were from bituminous coal. In 1921 sections of this paving were torn out and the concrete base was removed to determine the condition of the buckle plates, and although the paving itself was not impervious to water, the concrete base had provided perfect protection for the buckle plates. Three years ago the wood-block paving was removed and replaced with asphaltic concrete, but it was not found necessary to renew any of the concrete base.

Our experience has been that bridge paving supported on steel buckle plates with a concrete base having cinder aggregate resulting from the burning of bituminous coal affords ample protection against the corrosion of steel.

V. R. Covell,
Chief Engineer, Bridges,
Allegheny County.

Pittsburgh, Pa.,
Nov. 21, 1930.

George Rogers Clark, Soldier, Not Explorer

Sir—In the article in your issue of Nov. 20th on the old highway bridge spanning the Wabash River at Vincennes, Ind., reference is made to the proposed concrete arch bridge to be erected near the site of this bridge as a unit of the memorial to George Rogers Clark, *the explorer*. Colonel (later Brigadier General) George Rogers Clark in the service of Virginia during the Revolutionary War is famed for exploits not as an explorer but as a soldier and commander in planning and executing the reduction of the British posts of Kaskaskia, Cahokia and Vincennes in the territory northwest of the Ohio River during the years 1778 and 1779 whereby this territory, which embraced what is now Ohio, Indiana, Illinois, Michigan, Wisconsin and eastern Minnesota, was separated from British upper Canada, and by reason of American occupation was recognized as Virginia territory in the peace negotiations of 1782 and 1783. The military operations, especially against Vincennes in February, 1779, with a handful of men, no resources, in winter and through flooded lands, are regarded by historians as one of the outstanding military campaigns in the world's history.

Gen. George Rogers Clark's name is often confused with that of his youngest brother, Captain (afterward General) William Clark, co-explorer and co-commander with Capt. Merriwether Lewis, of the Lewis and Clark expedition of exploration of upper Louisiana territory in the years 1804, 1805 and 1806, from the mouth of the Missouri River, near St. Louis, to the Pacific Ocean at the mouth of the Columbia River, by command of President Thomas Jefferson.

Edwyn E. Watts,
Civil Engineer.

Princeton, Ind.,
Dec. 9, 1930.

News of the Week

Unemployment Relief Bill for $116,000,000 Passed by Congress

BEFORE adjourning for the Christmas holidays the two houses of Congress agreed to modified forms of the drought relief and emergency construction bills. These measures were sent to the White House on Dec. 20 and were promptly signed by the President. It is expected that the work authorized in the emergency construction bill will be under way early in the year, as plans for most of it have been completed.

The Senate withdrew an amendment stipulating that local wage rates must be paid and that local labor be favored in all public work under the act. Representatives of executive departments having charge of construction work pointed out that this would severely hamper the work.

The only other important matter on which the Senate and the House differed was in respect to specific appropriations for road work in Georgia and Alabama. An amendment was attached to the bill by the Senate continuing certain appropriations for highway work in those states and setting aside the provision that the states must match the federal government in these special appropriations. The House refused to accept this amendment and in the end the Senate withdrew it.

The total amount carried by the bill as it passed the House was $110,000,000. As it passed the Senate the total was $118,000,000. In the conference it was fixed at $116,000,000 and in this form the bill was finally passed and signed. The money is allocated as follows, but is available interchangeably on orders by the President:

National forest roads, etc.	$6,000,000*
Public land roads	3,000,000*
Federal-aid roads	80,000,000†
National park roads	1,500,000*
Rivers and harbors	22,500,000‡
Mississippi River flood control	3,000,000‡
Total	$116,000,000

*Appropriation runs to June 30, 1931.

†Available to Sept. 1, 1931, but only as a loan to states, the federal government to be reimbursed over five years, 1933-37, by reduced federal-aid apportionments in future authorizations under the federal highway act.

‡Available until expended.

Senate Confirms Nominees to Power Commission

Late last week the Senate voted to confirm the President's five nominees to the Federal Power Commission. The commission, which is now ready to function, will therefore consist of George Otis Smith, chairman; F. B. Williamson, Marcel Garsaud, Claude L. Draper and Frank McNinch.

Chicago Port Commission Organized

An unofficial organization sponsored by the Chicago Association of Commerce has been formed to care for the port problems of Chicago. It is modeled after the Chicago Regional Planning Association and is designed "to make Chicago a world seaport unhampered by present conflicting waterway regulations." Five waterway experts, including engineers, lawyers and freight traffic authorities, are to be appointed by R. I. Randolph, president of the association. The need for the new organization, named the Chicago Regional Port Commission, is indicated by the loss of $30,000,000 in annual traffic since 1919, attributed to uncoordinated planning and failure to make provision for through and divisional freight rates that would give the city the same advantages in waterborne commerce it now enjoys as a railroad center.

Advance Figures for Public Works to Be Undertaken in 1931

THE week's returns on *Engineering News-Record's* survey of public-works construction indicate that the 1931 program will be 30 per cent larger than that of 1930 and 35 per cent more than in 1929. The totals, extended on a straight population basis, are smaller than they were a week ago due to smaller per capita construction in the areas reported during the last week. The present estimate, based on the returns to date, is as follows:

1929	$2,393,000,000
1930	2,481,000,000
1931	3,245,000,000

Revised estimates will be published in subsequent issues based on more complete returns.

Wide World Photo

DARKNESS OVERTAKES THE BUILDERS OF THE EMPIRE STATE

Short days make lighting necessary for the workers on interior trim. The steelwork of the 200-ft. high observation tower atop the roof of the 85th floor is shown complete, with a light at its apex 1,250 ft. above the street.

Tyne Tunnel to Tie "Twin Towns" in England

Arrangements are being made in England for the construction of a vehicular tunnel under the River Tyne at a cost of $6,000,000 to link up North and South Shields, at present connected only by steam ferry. These two important industrial ports are opposite each other at the mouth of the Tyne, and from their position they are usually known as the "twin towns." South Shields is a separate county borough in Durham, but North Shields is now part of the municipal Borough of Tynemouth.

It was originally intended to build a bridge between the two towns at a cost of $10,750,000, but on the suggestion of expert engineers the municipal authorities concerned have decided to adopt the tunnel scheme. The proposed tunnel will be 27 ft. 6 in. in diameter, with a road and one footpath. It is expected that the ministry of transport will pay 90 per cent of the cost.

Property Owners and Officials Agree on Chicago Subway

The threat of 66 per cent of property owners of the 5-mile frontage of the Chicago subway in State St. to file a remonstrance petition delaying action for a year has been averted, since city officials have accepted the proposals of the property owners except as to the North Side concourse and the Erie St. station. Extension of the concourse south to Eighth St., increased height and entrance on Wacker Drive and store display windows at track level are the main points conceded. Individual objections as to the share of assessment to be paid by property owners must still be disposed of by the courts.

Parker Route for Colorado Aqueduct Approved by Board

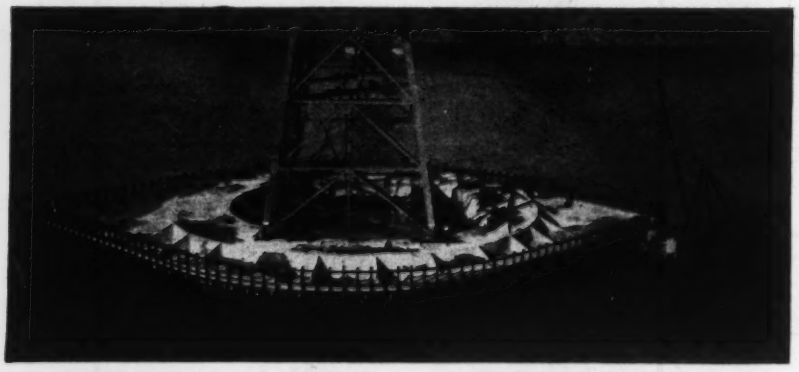
SELECTION of the Parker route for the projected aqueduct from the Colorado River to Los Angeles has been approved by the engineering board of review appointed by the Metropolitan Water District of Southern California to pass upon several proposed routes for such an aqueduct. The board is made up of Thaddeus Merriman, of New York; A. J. Wiley, of Boise, Idaho; and Richard R. Lyman, of Salt Lake City, Utah. The Parker route recently was recommended by Frank E. Weymouth, chief engineer of the district, as reported in our issue of Nov. 27, 1930, p. 854.

The Parker route is 265.5 miles long and is a pumping route with a total pumping lift of 1,523 ft. It calls for the construction of a diversion dam across the Colorado River a few miles above Parker, Ariz., at a cost of approximately $13,000,000 if permission for its construction can be obtained from the State of Arizona, otherwise direct diversion and clarification.

The engineering board recommends delay in construction of this dam until several years after the completion of Boulder Dam in order to obtain advantage of the silt control to be effected by that structure.

The cost of the project to deliver ultimately 1,500 sec.-ft. to Los Angeles is estimated at $200,000,000. The first pumping equipment to be installed would deliver 800 sec.-ft.

Thaddeus Merriman described the Parker route as the best geological route considering earthquake hazards and terminal storage facilities. Only 0.74 mile would be open canal.



PROTECTING BRIDGE PIER FROM DAMAGE BY SHIPS

The fender protection erected around the central pier of the Carquinez highway toll bridge, which spans the upper arm of San Francisco Bay, has been completed. The work was done at the order of the war department to protect the pier from damage by ships. The construction involved placing 200,000 tons of rock in the bottom of the Carquinez Strait in water from 100 to 120 ft. deep, driving therein 454 reinforced-concrete piles 100 ft. or more in length and building on top of these piles a circular concrete girder and wharf structure, involving approximately 5,000 cu.yd. of concrete and 1,000 tons of reinforcing steel. The cost of this structure was $618,000. Construction, by Healy-Tibbitts Construction Co., was begun in July, 1928, and was completed and accepted on Dec. 3, 1930. A description of this fender protection was published Nov. 27, 1927, p. 794.

Chicago Water Certificate Sale Upheld by Court

Sale by the city of Chicago of $12,000,000 of water certificates under the authority granted by the Illinois legislature in 1929 was upheld by the state supreme court on Dec. 18. The certificates were issued provisionally on Oct. 7, when an option on their purchase was obtained by a syndicate of Chicago and New York banking houses at a price representing a total premium of $85,000. According to the authority granted by the legislature the certificates must be sold during 1930.

Concrete Institute Program Taking Shape

In connection with the 27th annual convention of the American Concrete Institute, which will be held in Milwaukee, Wis., Feb. 24, 25 and 26, the program committee has had several meetings from which have come tentative plans for papers and reports. Inasmuch as producers of concrete masonry units in the Milwaukee territory are unusually active and progressive, their problems will be among those particularly stressed in the program. It is understood that a report of an investigation made of continuous and batch mixers, showing a strong argument in favor of continuous mixing, will be presented. The shrinkage of concrete masonry will be the subject of a paper by W. D. M. Allan, of the cement products bureau of the Portland Cement Association. A new recommended practice for the manufacture of concrete masonry units will be presented by P. M. Woodworth, chairman of a committee on the subject.

Other reports and papers of interest to concrete product manufacturers will be a Bureau of Standards investigation of waterproofing by P. H. Bates, the report of a twenty-year test in a 50-year investigation and five-year results in a 100-year program in studying the strength of concrete as affected by age and curing conditions, by M. O. Withey, University of Wisconsin.

Concrete permeability tests will be reported upon by Professors P. T. Norton and Dan H. Pletta, also of the University of Wisconsin. Cinder concrete will be discussed by Einer Christensen in a report summarizing available information on cinders as concrete aggregate, while another committee chairman will report on burned clay and shale aggregate. The significance of lightweight concrete to the building designer will be analyzed by Frank A. Randall, chairman of a committee on the subject.

It is announced that papers and discussions reporting recent highway investigational work in Wisconsin in which the U. S. Bureau of Public Roads has participated will be given. Kenneth H. Talbot, director of research, National Equipment Corp., is chairman of the local convention committee. The program is in charge of P. H. Bates, chief of the clay and silicate products division, U. S. Bureau of Standards.

Heavy Snow Presents New Problem to Southern Highway Men

A storm covering a great expanse of the Southeast on Dec. 16 and 17 brought precipitation ranging from heavy rain and sleet along the Gulf and Atlantic coasts to snowfall reaching the unprecedented depths of 12 to 30 in. over most of the Piedmont section of the two Carolinas, with 4 in. as far south as Atlanta. Street and highway traffic was completely paralyzed for a time. In fact, even the main arteries of the highway systems in the affected area were blocked. Bus and other motor traffic ceased for from a few hours to a day or more. Street cars fared even worse. But main-line rail movements experienced comparatively slight delays, with little interruption on branches.

Except in limited mountain districts, where the snowfall was not so heavy nor so unusual, the state highway departments maintain no snow-fighting equipment. Even in the mountain areas reliance for snow removal is placed almost entirely on drags or blade machines drawn by trucks or tractors. As most of the main stems of the systems are paved, maintenance equipment that could be used for snow removal was lacking from them. Moreover, this type of equipment was largely isolated by the storm on secondary and third-class roads.

Conditions in the cities and towns were similar. Where there are street-car systems, the rare occurrence of even limited snow precludes any provision for snow-removal equipment. Municipal street-cleaning departments are not equipped to meet such an emergency as occurred.

From the personnel point of view the handicaps were likewise serious. None of the organizations affected had seen such a great depth of snow locally. Common labor, in particular, was temporarily dazed.

In the face of such conditions the rapidity with which street and highway traffic was restored was remarkable. In fact, practically all the main highways were open in less than 24 hours. Street-car traffic did not fare so well. Lacking the necessary plows and brooms, tracks could be cleared but slowly. And for a time motor traffic kept switch points and turnouts clogged so movement of cars was impossible.

Continued cold and overcast weather for several days following the storm made ice conditions on the pavement bad over large areas. On account of the snow being dry and light when it fell, there was practically no structural damage. This largely accounted, also, for the comparative ease of moving rail traffic. It further avoided damage to wire and transmission lines. And the slowness with which melting occurred, coupled with unusually low streams, precluded any flood conditions. In fact, the snowfall, exceeding all known records over probably more than 100,000 square miles, should materially help restoration of depleted water resources.

Tracks and Cargo Cranes as Port Facilities

Modern marine terminal developments usually require tracks along the water side for handling cargo directly between ships and cars; this requirement in turn involves a wide wharf or apron between the water side and the cargo shed. For American ports, cargo can be handled more efficiently and economically by ship's gear than by wharf cranes. These three conclusions summarize the findings of the 1930 report of the research committee of the American Association of Port Authorities, as prepared by G. F. Nicholson, harbor engineer of Los Angeles, Calif. An abstract of this report follows:

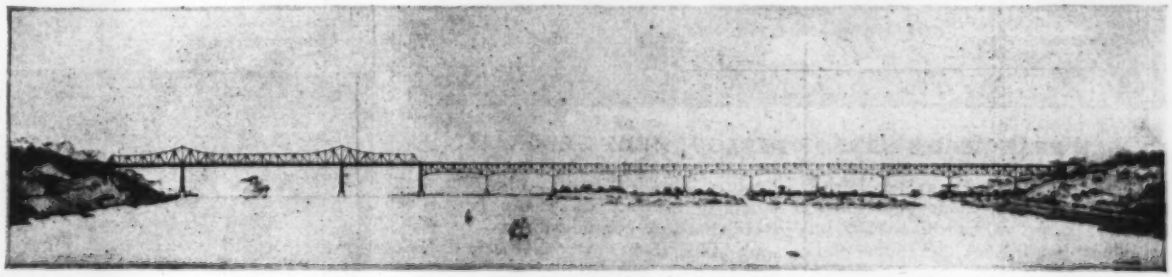
With larger vessels and their increased cargo capacity the rapid dispatch of freight requires wider aprons to provide greater cargo-handling space, and two shipside tracks are generally installed. Replies to a questionnaire showed widths of 14 to 90 ft., with one to three tracks; but the more modern facilities have apron wharves 25 or 35 ft. wide with two tracks, one alongside the ship and the other as a running track for the efficient switching of cars. In some cases cargo is handled to or from cars on both tracks for more rapid operation. Depressed tracks have proved unsatisfactory, as temporary aprons must be placed over them when cargo is handled directly between shed and ship. A width of 32 ft. with two tracks is recommended where there is considerable freight handling between cars and ships. But if locomotive cranes are to operate on the shipside track the tracks must be 19 ft. center to center, and the width of wharf will be 39 ft. Where the service is light and only one track is required, a 20-ft. wharf width is sufficient, and even where no tracks are laid, a 20-ft. width is still necessary for efficient handling of freight. Where tracks are not used and weather conditions make it advisable to handle cargo directly from ship to shed, as at New York, a wharf width of 3 or 4 ft. is sufficient.

Extensive use of semi-portal gantry cranes at north European ports is due to the extensive business with barges, which have no hoisting gear. In many such cases, ships load and discharge cargo in midstream, and handling cargo to and from barges is the more important problem. For northern ports of the United States this equipment is not desirable, on account of the first cost and the cost for operation, maintenance and depreciation. The revolving crane is slower than ship's gear, as the former has to be swung and spotted while the latter operates in a straight-line motion. Dock cranes with a straight-line motion were installed at a Pacific port and worked as fast as ship's gear, but their expense has not been justified. With the increased efficiency and longer booms of modern ship tackle, this method is considered superior to the use of shipside cranes.

For handling miscellaneous cargo at the wharf and shed, light tractors, trailers and conveyors form the most suitable equipment for both ocean and inland ports. Where heavier equipment is needed, locomotive cranes are suitable. For very heavy lifts a floating crane with capacity of 75 tons or more is better than shear-leg or stiff-leg derricks on account of its mobility or portability.

Town Planning Commission Appointed in Montreal

Appointment of a town planning commission, which has been under consideration in Montreal for several years, has been announced. The board will be composed of A. Beaugrand-Champagne, chairman; Raoul Lacroix, Ludger Venne, Frederick G. Todd, L. E. Schlemm, Aime Cousineau and J. E. Carmel, the latter a civil engineer.



PROJECTED RIP VAN WINKLE BRIDGE

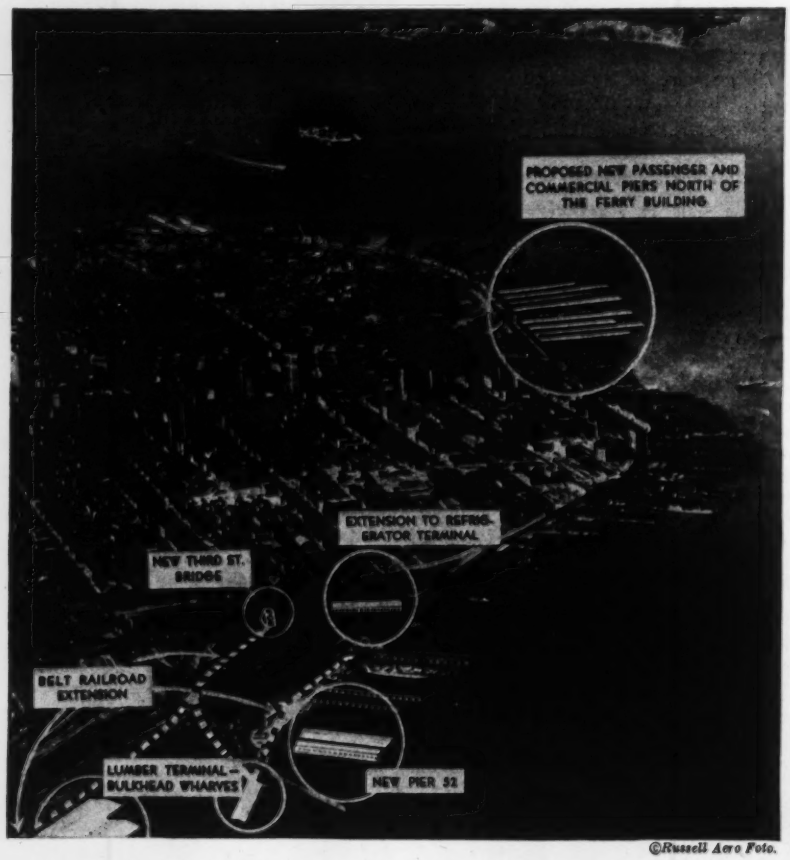
War department approval has been secured for this structure across the Hudson River between Catskill and Hudson, N. Y., about one mile north of Catskill. The main river crossing will consist of an 800-ft. cantilever span with a navigation clearance of 142 ft. Full clearance width between piers will be 760 ft. The two anchor arms each have a span of 400 ft. The approach viaduct consists of one 247½-ft. span and nine 330-ft. spans, designed as alternate fixed and cantilever spans. The plans provide for a 30-ft. clear roadway and one 4-ft. 6-in. sidewalk. Borings for the work have been completed. The design has been prepared by Glenn B. Woodruff, of New York City, acting as consulting engineer to the state department of public works, which was authorized by the 1930 legislature to construct the bridge. Recently Governor Roosevelt proposed that the legislature create a Hudson River Bridge Authority which would undertake the construction of this bridge and the operation of this and the recently completed Mid-Hudson Bridge as joint toll structures. Decision on this matter rests with the next session of the state legislature, which meets for its regular session early in January.

New All-Rail Route Across British Columbia

A through all-rail Canadian Pacific Railway service will be provided from Vancouver across the most southerly part of British Columbia to Lethbridge and Medicine Hat in the Province of Alberta with the opening on Jan. 1 of the new rail link around Kootenay Lake between Proctor and Kootenay Landing. With its main line farther north, the completed southern route will give the Canadian Pacific two all-rail lines spanning British Columbia and connecting Vancouver with the Prairie Provinces. Previously the southern route was interrupted by the steamer connection on Kootenay Lake. To clear a way for the railway along Kootenay Lake approximately 1,500,000 tons of rock was blasted out.

New Contract Awarded for Raising Aswan Dam

The contract for continuing the work of heightening the Aswan Dam has been awarded to Topham, Jones & Railton, of London. The original contract for the work was awarded in November of last year to Sir John Norton-Griffiths & Co., but difficulties arose and work was suspended last September, Sir John Norton-Griffiths shortly afterward being found dead.


PROPOSED NEW PASSENGER AND COMMERCIAL PIERS NORTH OF THE FERRY BUILDING
EXTENSION TO REFRIGERATOR TERMINAL
NEW THIRD ST. BRIDGE
BELT RAILROAD EXTENSION
LUMBER TERMINAL—BULKHEAD WHARVES
NEW PIER 52

©Russell Aero Foto.

SAN FRANCISCO'S HARBOR IMPROVEMENT PROGRAM

The $10,000,000 San Francisco harbor expansion program, made possible by the voters' approval of the harbor improvement bond issue, includes plans for the construction of nine modern concrete piers capable of docking the largest liner afloat. The plans call for doubling the capacity of the present state grain terminal at Islais Creek to handle the grain exports of a large area of California; enlargement of the state refrigerator terminal for the benefit of California farmers; extension of the State Belt Railroad, which will eliminate certain switching charges now borne by shippers, and construction of a lumber terminal with two bulkhead wharves at Central Basin. This expansion program was officially started when the board of state harbor commissioners recently took steps to begin construction work immediately with funds now on hand in order to afford relief for unemployment, without waiting for the sale of the new bonds. The board has awarded the contract for the substructure for the new pier 23, to cost approximately $700,000, the first unit in the improvement program. The new pier will be 800 ft. long and 150 ft. wide, capable of berthing the largest vessels on the Pacific. It will be a concrete-jacketed pile structure with a deck of reinforced concrete. The superstructure will be a steel frame, concrete shed.

RANDOM LINES

New Engineering Device Out

That 185-ft. darning needle on top of the Chrysler Building in New York was, according to the New York *Herald-Tribune*, "projected with great secrecy into the upper regions by means of a device known as a vertex." We learn something every day.

* * *

Word Picture

Appropos of flood control by damming the mountain tributaries, every small town in the headwaters near a dam site is looking ahead to the incidental benefits. Picture writing about these streams makes good copy for the local newspapers. Sioux Falls, S. D., is not too far from the Black Hills to print a column from its Hot Springs correspondent, E. H. Klock. While Mr. Klock is apparently not an engineer, his descriptions are of interest, as witness:

> Here in this narrow gateway, a dam can easily be constructed. The groundwork for such a dam is solid. The pond or lake formed would have a firm bottom, practically bedrock, so there could be little danger of the dam washing away. Such a dam could be built a mile high, and if that was not high enough, it could be taken even higher than that. No water could ever get away from it, for the impounded water would be surrounded by mountains.

* * *

Information Wanted

Snatched away from "Letters to the Ed.":

> Sir—The attached illustration from the *Forum* was called to my attention by a friend who desires to purchase a stone crusher of this type for use on his chicken ranch. As I was unable to tell from inspection just who the maker might be, I am referring it to you.
>
> In case you are unable to give me the information, perhaps you could reproduce it and possibly some of your readers would be more familiar with machinery of this description.
>
> Cincinnati, Ohio. T. P. YOUNG.

Brief News

WORK will be started immediately upon the new pier 23 in San Francisco harbor, following the letting of the contract to the Healy-Tibbitts Construction Co. for the substructure on a bid of $347,597. The entire pier, which will be a concrete pile jacketed structure 800 ft. long and 150 ft. wide, is expected to cost $700,000. It is part of San Francisco's $10,000,000 harbor expansion program.

AT A SPECIAL ELECTION Dec. 16 the freeholders of Duval County, Florida, defeated the proposed $6,500,000 bond issue for a second toll bridge across the St. Johns River and two additional roads to the beaches.

THE SOUTHERN PACIFIC has been authorized by the Interstate Commerce Commission to acquire control of the Gulf & West Texas Ry. by purchase of all its capital stock, $300,000, to be issued in connection with the construction and operation of a line approximately 200 miles long between San Antonio and San Angelo, Tex. Construction of the line is to be financed either by the Southern Pacific or its subsidiary, the Texas & New Orleans, and when completed will be operated by the subsidiary.

CONTRACT for filling in the land for a rail terminal for the Gulf, Mobile & Northern R.R. in New Orleans has been awarded to the McWilliams Dredging Co., a local concern. It is necessary to raise the land 4 or 5 ft. The terminal will be located along the industrial canal where direct connection can be had with oceangoing ships. It will accomodate 4,000 freight cars.

BIDS WILL BE RECEIVED by the state highway department in Columbia, S. C., Dec. 30 for the construction of highway and bridge work to cost more than $5,000,000. This letting will include sixteen paving and nine bridge projects.

PORT IMPROVEMENTS in Montreal harbor during the winter months will include the erection of new wharves at Windmill Point, involving an expenditure of nearly $1,500,000. During the next four months nearly 1,500 ft. of new wharf will be built.

INDUSTRIAL FATALITIES reported to the New York state department of labor during the month of November numbered 139, the lowest record for any month since November, 1928.

RECENT REVISIONS in the rules of procedure before the California railroad commission have been printed and are available for distribution upon application. The most important change is in the rule governing the preparation of applications for new highway grade-crossing construction by cities, counties and railroads.

AS AN EXAMPLE of speed in getting public work under way following approval of a bond issue by voters, the county commissioners of Multnomah County, Ore., offer the Hawthorne bridge reconstruction job in Portland. Voted on Nov. 4, the $155,000 bond issue has been certified by the commissioners and approved as to legality by bond attorneys of Boston. Bids will be advertised three weeks and the contract let early in January within 60 days of the authorization given by the voters.

CONSTRUCTION OF A TUNNEL under the city of Vancouver, B. C., will be begun soon under a contract awarded to the Northern Construction Co. and J. W. Stewart by the Canadian Pacific Railway. The tunnel will eliminate five grade crossings is a busy part of the downtown area. Its cost is estimated at $1,750,000.

MORE THAN 12,000 New York State corporations have been dissolved by the secretary of state, they having failed to file an annual franchise tax return, as prescribed by law, during the five years preceding June 30, 1930.

AN ASSOCIATION of former members of the 10th and 20th Engineers, A.E.F., is being projected. All former members are requested to write to D. R. Meredith, 205 East 42d St., New York City, or to F. S. McNally, 5728 Grand Central Terminal, New York City. It is planned to hold a meeting of the new association during the Northeastern Retail Lumbermen's Association convention, at the Pennsylvania Hotel, New York City, Jan. 27-29.

AN UNUSUAL SAFETY RECORD was established by the Hercules Powder Co. during November in operating all its twenty plants, employing 2,805 workers, without a lost-time accident. During the past five years, in which a special effort has been made to eliminate accidents, injuries have been reduced approximately 90 per cent, largely due to improved management and education of workers, according to company officials.

THE FORMATION of an organization to be known as the Kansas Highway League to foster a five-year highway construction program in Kansas costing $40,000,000 to be raised by county bonds and retired from the state highway department revenues has been announced by W. V. Buck, state highway engineer.

DEEPENING THE CHANNEL of the St. Lawrence River to 35 ft. from Montreal to tidewater to accommodate vessels up to 20,000 tons is being undertaken on a subcontract awarded to General Dredging Contractors, Ltd., by Canadian Dredge & Dock, Ltd. It is expected that the work will take four years.

ADDITIONAL EXPENDITURE of $5,302,069 for relief work for the unemployed has been approved by the dominion government of Canada, which brings the total up to $58,136,702, including $11,514,000 to be expended by the Canadian Pacific Railway and $14,159,403 by the Canadian National Railways.

The Business Outlook

As we draw nearer the end of this year there are a few faint signs that business is beginning to pull itself together in preparation for an effort to turn the tide when the next one begins. Resistance to further decline has stiffened slightly as the wave of liquidation has become heavier. Although our index of business activity fell somewhat further, from 77.5 per cent of normal to 76.3 per cent, steel production held up against the usual seasonal downtrend, electric power production was fairly well sustained, merchandise carloadings were somewhat higher than the seasonal expectation, and the volume of commercial loans and currency in circulation continued to expand. Firmness in steel prices is being maintained, and both security and commodity markets give encouraging indications of reaction to excessive liquidation under more deliberate support.

—The Business Week, Dec. 24.

Contract Let for Phoenix, Ariz., Water-System Improvement

The contract for the water-system improvement in Phoenix, Ariz., was let Dec. 6 for $2,059,140.15 on a joint bid of Schmidt-Hitchcock, Phoenix contractors, and the American Concrete Pipe Co., of Los Angeles and Phoenix. Items included are the laying of 31½ miles of supply line, of which approximately 22 miles, the Verde River flow line, will be 54-in. pipe; construction of a 20,000,000-gal. circular reservoir; and laying approximately 10 miles of smaller distribution lines. The large pipe is to be centrifugally spun, delivering 30,000,000 gal. of water to the city of Phoenix daily, displacing 35 miles of 36-in. redwood pipe, now delivering 15,000,000 gal. per day.

Work Begun on Burrard Bridge in Vancouver

Work has commenced on Burrard bridge, the newest link in the traffic system of Vancouver, B. C., and the largest project of its kind yet initiated in that city. A year ago $2,800,000 was voted toward the project. According to schedule the opening ceremony should take place in July, 1932. The bridge, between street approaches, will be about three-quarters of a mile long. Five piers will be sunk in False Creek, the two central tower piers being 44 ft. under high water mark and 31 ft. below low water. These structures, which will bear the weight of the center steel span, will have a base of 41.6x102 ft. at their foundations and will rise 191 ft.

Prizes for Steel Bridge Design

The third annual student competition for prizes for the best designs of a steel bridge is announced by the American Institute of Steel Construction. There will be two competitions, each having a first prize of $500, a second of $250, and a third of $100, one going to engineering students and the other to architectural students. The first competition will be judged by a national jury of engineers and architects and is open to any engineering student attending a school or college in the United States or Canada. The second will be held through the Beaux Arts Institute of Design.

Essay Contest Winner Announced

The New York State Association of Highway Engineers announces the award to Earl I. Fuller, engineer in the state highway division headquarters at Watertown, of the first prize of $100 in an essay contest sponsored by the association. The subject of the essay, which was submitted some time ago, was "Contributions of Highway Engineers to Public Welfare."

Obituary

ALLEN HUBBARD, a member of the Boston consulting engineering firm of French & Hubbard, died on Dec. 14. He was 50 years old.

A. S. WELLES, chairman of the Florida state railroad commission, died at his home in Tallahassee on Dec. 16. Mr. Welles was 65 years old and had been a member of the commission for ten years.

FRANKLIN MORGAN RANDALL, city engineer of Fort Wayne, Ind., for more than 40 years, died recently at his home. Mr. Randall was 70 years old.

REUBEN WELLS LEONARD, of St. Catharines, Ont., died on Dec. 17 after four years' illness, aged 70 years. Mr. Leonard, after his graduation from the Royal Military College, Kingston, joined the staff of the Canadian Pacific Railway and became resident engineer of construction of the Lake Superior division and afterward engineer of survey and construction in Manitoba and Ontario. He was in charge of the construction of the first hydro-electric development at Niagara Falls, Ont., for the Park & River Railway Co. in 1892-93. In 1911 he was selected by the dominion government as chairman of the National Transcontinental Railway Commission, with jurisdiction over construction of the railway from Moncton, N. B., to Winnipeg. He was a past-president of the Engineering Institute of Canada.

WALTER SCRANTON, a former president of the Lackawanna Steel Co., Buffalo, N. Y., and a member of the family which founded Scranton, Pa., died Dec. 11 at Pasadena, Calif. He was 82 years of age and had been retired from active business many years.

HARRY L. MONTFORD, civil engineer, formerly connected with the California highway commission, died in Sacramento on Dec. 11, at the age of 41. Mr. Montford was superintendent for the highway commission on the Lake Tahoe road construction around Emerald Bay.

CARLTON C. WITT, supervising engineer of the Interstate Commerce Commission, died of a heart attack on Dec. 18 at his residence in Washington, D. C. Mr. Witt was graduated from Purdue University in 1900 and had been engineer for the South Dakota railroad commission and the public service commission of Kansas. He had been connected with the Interstate Commerce Commission since 1913.

WALTER THEODORE KRAUSCH, engineer of buildings, Chicago, Burlington & Quincy R.R., died on Dec. 8. Mr. Krausch was born in Philadelphia, Pa., in 1869 and began his career with his father's firm, Theodore Krausch & Co., Buffalo, N. Y., architects and engineers for railway structures. He was in the engineering department of the Chicago, Burlington & Quincy R.R. from 1893 to 1905, when he went to Fairbanks, Morse & Co., but in 1912 he returned to the railroad as engineer of buildings. Mr. Krausch was a member of the American Railway Engineering Association and the Western Society of Engineers.

WALTER HAGAN GAHAGAN, president of Walter H. Gahagan, Inc., constructing engineers, of Brooklyn, N. Y., died on Dec. 18 of heart disease. He was 66 years old. Mr. Gahagan attended the Ohio State Technical School and the Massachusetts Institute of Technology and early in his career was engineer for various St. Louis firms. In 1889 and 1890 he was principal assistant engineer to H. W. Parkhurst, resident engineer on the St. Louis Merchants bridge. Afterward he built seven bridges over the Snake and Red rivers in Arkansas. Coming to New York City in 1897, he was in charge of the construction of the Manhattan pier of the Williamsburg Bridge. In 1899 he started in business for himself and had been connected with various important contracting dredging operations. These included dredging the Chesapeake Canal from Chesapeake Bay to Delaware Bay, dredging in the Jamaica Bay area and dredging a channel in the Hudson River from Coxsackie to Hudson. He was a member of the American Society of Civil Engineers and of the Associated General Contractors of America.

Society Calendar

AMERICAN ROAD BUILDERS ASSOCIATION, Washington; annual convention and road show, St. Louis, Mo., Jan. 10-16.

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York City; annual meeting, New York, Jan. 21-23.

ASSOCIATED GENERAL CONTRACTORS OF AMERICA, Washington; annual meeting, San Francisco, Jan. 26-28.

ENGINEERING INSTITUTE OF CANADA; annual meeting, Montreal, Feb. 4-6.

NATIONAL CRUSHED STONE ASSOCIATION, Washington; annual convention, St. Louis, Mo., Jan. 19-22.

NATIONAL PAVING BRICK ASSOCIATION, Washington; annual meeting, Pittsburgh, Pa., Feb. 4-6.

NATIONAL READY MIXED CONCRETE ASSOCIATION, first annual convention and exhibit, St. Louis, Mo., Jan. 26.

NATIONAL SAND AND GRAVEL ASSOCIATION, Washington; annual convention, St. Louis, Mo., Jan. 27-29.

AMERICAN SOCIETY FOR TESTING MATERIALS will hold a regional meeting in Pittsburgh, Pa., on March 18, for which, in cooperation with the Pittsburgh section of the American Welding Society, a symposium on welding is being arranged.

CALIFORNIA STATE CHAMBER OF COMMERCE will hold the seventh annual Iron and Steel Conference at Del Monte Feb. 12-14. Charles S. Knight, director of the industrial department of the state chamber, is secretary of the Iron, Steel and Allied Industries of California. Many important problems of the industry will be presented at this gathering. New standard practices will be considered, as well as safety standards to reduce rates of compensation insurance, ways to improve methods of merchandising, and the importance of ethics in business.

EMPIRE STATE SAND AND GRAVEL ASSOCIATION at its sixth annual convention in Rochester on Dec. 17 adopted a resolution that contractors executing public contracts should furnish a bond assuring payment for labor and materials used on the job. Necessary legislation will be asked from the approaching session of the general assembly.

ENGINEERS CLUB OF OMAHA at its annual meeting on Dec. 10 elected the following officers: president, S. B. Hughes; vice-president, John M. Gibb; secretary, Arthur Walker; treasurer, John Detweiler.

LOS ANGELES SECTION, American Society of Civil Engineers, has elected officers as follows: president, Robert Linton, general manager, Pacific Clay Products Corp.; vice-presidents, O. A. Stone and A. L. Sonderegger, consulting engineers; secretary-treasurer, Macy Jones, Harold G. Ferguson Co.

MOHAWK VALLEY ENGINEERS CLUB met in Utica, N. Y., on Dec. 16, and listened to a paper by E. W. Wendell, grade-crossing engineer, New York state department of public works. Mr. Wendell advocated basing highway design on a vehicular speed of 40 to 50 miles an hour and the elimination of "absurd" traffic lights on through routes which cause delay and congestion.

NORTH DAKOTA WATER AND SEWAGE WORKS CONFERENCE held its second annual meeting at Grand Forks Dec. 8-10. Many papers of interest were read and discussed. Officers were elected as follows: president, W. P. Tarbell, city engineer, Fargo; vice-president, F. W. Pinney, city engineer, Jamestown; secretary-treasurer, A. L. Bavone, state sanitary engineer, Bismarck. Fargo was chosen as the meeting place for next year.

ONEIDA COUNTY CHAPTER, New York State Chapter of Professional Engineers and Land Surveyors, at its meeting in Utica, N. Y., on Dec. 12, elected the following officers: president, Harold Rice, Rome; vice-president, Byron White, Utica; secretary-treasurer, E. A. Gruppe, Utica.

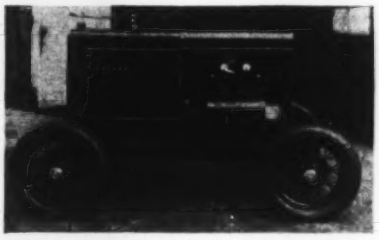
SAN FRANCISCO SECTION, American Society of Civil Engineers, held its annual meeting on Dec. 16 and elected the following officers: president, Leon B. Reynolds, department of civil engineering, Stanford University, Palo Alto; vice-president, H. H. Hall, chief engineer, Standard Oil Co., San Francisco; secretary-treasurer, Harold B. Hammill, consulting engineer, San Francisco. The section voted to approve the action of the San Diego section in condemning the advertising for bids for engineering services by the city of San Diego. Dexter S. Kimball, deal of engineering, Cornell University, was the principal speaker. His subject was "Technological Unemployment."

SEWAGE WORKS OPERATORS will be enabled to attend a short school Jan. 26-31 to be held at Union College, Schenectady, N. Y., sponsored by the New York State Sewage Works Association, New York State Conference of Mayors and the New York state department of health.

Construction Equipment and Materials

Generator Set for A.C. Welding

Current for welding with the a.c. semi-arc flash process is produced by a new all-purpose portable welder de-

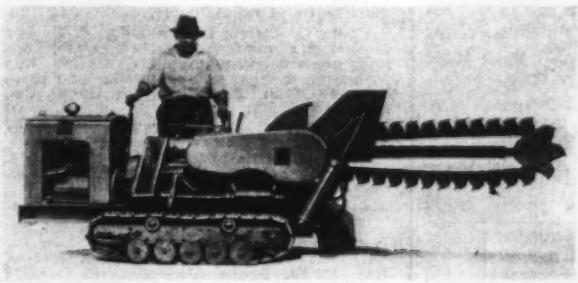


A.C. MOTOR GENERATOR SET

signed especially for structural work by the Electric Arc Cutting & Welding Co., Newark, N. J. Models are available with capacities of 100-, 200- and 300-amp. machines, as well as double generator sets which multiply these capacities by two. All generators are arranged with a.c. rings so that either single or polyphase alternating current can be obtained. Power is provided by Buda gasoline motors. An important auxiliary is a transformer which can be used to convert part of the output of the generator to 110 or 220 volts for lighting or for the operation of electric tools. Due to a special field excitation arrangement, this auxiliary current remains constant in voltage.

Digger Cuts Narrow Trench

Digging ditches for laying small pipe, electric cables or drains or for any other purpose requiring a trench up to 6 in. wide and 48 in. deep is facilitated by the development of the Little Golddigger trenching machine by the C. & H. & E. division of the National Equipment Corp., Milwaukee, Wis. Although only waist high, this machine is of rugged, well-balanced construction, and is designed for severe and continuous service. It is mounted on crawler treads with very low ground pressure so that it can be operated effectively in wet soil or on lawns or parkways. Total weight is 3,000 lb. The light weight and small dimensions of the outfit make it possible to transport it easily from job to job in a motor truck. Digging speeds vary from 1 to 6 ft. per minute. All controls are centralized on one side. Power is provided by a Fuller & Johnson four-cylinder motor developing 12 hp. at 1,600 r.p.m. The boom hoist is operted by a hydraulic cylinder which acts either to lift or to crowd. The self-cleaning buckets, of chrome nickel alloy steel, heat treated, are mounted on a reversible bucket line.



SMALL DITCHING MACHINE

Crane Mounted on Light Tractor

An additional attachment for the Clarktor Tructractor, consisting of variable height crane boom with a capacity of 2,000 lb. at a radius of 13 ft., has been announced by the Clark Tructractor Co., Battle Creek, Mich. With a minimum over-all height of only 7 ft. 10 in. and a wheelbase of 108 in., this

TRACTOR-MOUNTED CRANE

unit can easily be maneuvered in restricted spaces. A single lever is used to control lifting, lowering and neutral position of the load. A description of the tractor unit upon which the crane is mounted was given in *Engineering News-Record*, Nov. 13, 1930, p. 789.

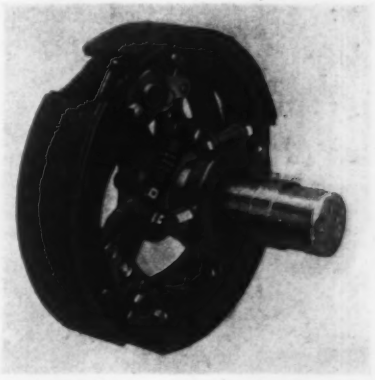
Pedestrian Control for Traffic

Points on a highway where there is a large amount of transverse pedestrian traffic but little vehicular transverse traffic can be protected by means of ordinary traffic signals controlled by a pushbutton device developed by the Automatic Signal Corp., New Haven, Conn. This control is very simple to operate and is particularly recommended for use at crossings where large numbers of schoolchildren must cross during certain periods. To operate, the pedestrian simply pushes a button mounted on a post, thus stopping traffic on the street until a sufficient interval has elapsed to enable him to cross. To avoid undue interference with highway traffic, an interlocking arrangement is provided to secure automatically a "go" light for a predetermined period after each such crossing interval. Should a second pedestrian push the button during this interval, the device will "remember" him until the interval has elapsed and then stop the street traffic once more.

Long Life Claimed for New Type of Industrial Clutch

Compactness, light weight, easy adjustment and long life are advantages claimed for a new type of heavy-duty industrial clutch developed by Thomas L. Fawick and now being marketed by the Fawick Manufacturing Co., Waukesha, Wis. The clutch is of the balanced expanding shoe type, the shoes being connected to a system of counterweights which make the effort of engagement or disengagement the same under all conditions of load, wear and service. Lightness of all rotating parts is secured by the liberal use of steel stampings, hollow steel pivot pins and steel forgings. Molded asbestos clutch facings are used, similar to those in heavy truck and bus brakes. Adjustment of the clutch is extremely simple, being accomplished by a small worm meshing with a gear which engages three eccentric studs carrying the inner ends of the shoe toggles. Movement of the adjusting worm causes each of the three eccentric studs to rotate simultaneously and exactly the same amount. Thus it is impossible for one shoe to become tighter than the others or for the clutch to get out of balance. Notches are cut on the outside of the worm to engage a detent spring, which prevents accidental changes of adjustment.

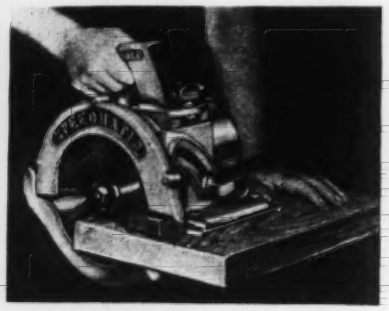
The clutch is located inside the flywheel, with the driving shoes in contact with the rim of the wheel itself. This affords a large body of metal through which heat is dissipated and which is ventilated by the fan action of the revolving clutch shoes. This feature adds to the ability of the clutch to withstand service where continuous slipping is unavoidable.



12-IN. INDUSTRIAL CLUTCH

High-Speed Electric Saw Driven Through Gears

An additional model of the Speedmatic saw, known as type K-9, which differs from previous types in the use of hardened spiral gears to drive the blade has been announced by the Porter-Cable-Hutchinson Corp., Syracuse, N. Y. This unit has a weight of 23 lb.

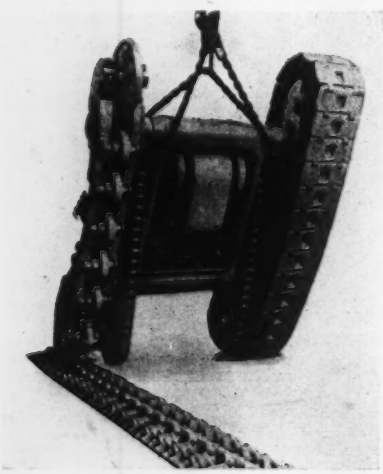


POWER HAND SAW

and operates at unusually high speed, the 9-in. saw blade running at 5,000 r.p.m. free speed, or about 4,000 r.p.m. under the average cutting load. This speed is correct for using thin emery wheels for cutting marble, tile and soft metal. The saw is equipped with both depth and angle adjustments, and will cut to a maximum depth of 3⅛ in. Cooling is provided by a large turbine fan which draws air through the commutator and expels it through the saw housing and also through a special opening to blow away dust from the cutting line. Four SKF precision ball bearings are used. A swing guard is provided.

Crawler Tread Improved

Chain drive is used in a new and improved crawler-type mounting now being used by the Bucyrus-Erie Co., South Milwaukee, Wis., as regular equipment on the model E-2 diesel dragline. The standard mounting, with 27-in. treads, has an over-all length of 13 ft. 8½ in. and a bearing area of 51.9 sq.ft. The special long tread has the same width as the standard, but is 15 ft. ¾ in. in over-all length with a bearing area of 57.9 sq.ft. A unit equipped with either of these treads can be shipped on a flat-car without dismantling. By substituting wider treads the bearing areas of these two mountings can be increased to 63.3 and 70.8 sq.ft., respectively.



DRAGLINE CRAWLER

Tamper Added to Finisher

For use with dry, stiff concrete when tamping is permitted or specified, the Ord finishing machine for concrete pavements, manufactured by the Blaw Knox Co., Pittsburgh, Pa., can now be furnished equipped with a tamper. The finisher, which runs on wheels bearing on the steel forms, can be obtained with either single or double screed, and with or without tamper.

Twist and Hammer Drill

Drilling holes in wood, metal or masonry, using either twist or hammer drill action, is the dual function of an electric portable drill developed by the Wodack Electric Tool Corp., 4627 West Huron St., Chicago, Ill. In addition, the tool can be used for grinding, scratching or buffing, permitting the operator to sharpen tools and bits on the job. The tool weighs only 12 lb., and will drill holes in stone, concrete or brick up to ⅞-in. diameter; in metal to ⅜-in.; and in wood to ½-in.

ELEMENTS OF DUAL ELECTRIC DRILL

Costs and Contracts

E. N.-R. Index Numbers

Cost			Volume		
Dec. 1,	**1930**	**196.86**	**Nov.,**	**1930**	**207**
Nov. 1,	1930	198.54	Oct.,	1930	211
Dec. 1,	1929	209.46	Nov.,	1929	245
Average,	1930	202.85	Average,	1929	317
Average,	1929	207.02	Average,	1928	287
1913	.....	100.00	1913	.....	100

This Week's Contracts

Heavy construction contracts, reported by *Engineering News-Record* in the week of Dec. 25, with some comparisons, total as follows:

(In Thousands of Dollars)

	Dec. 25, 1930	Average of Last Four Weeks 1930	1929
Buildings:			
Industrial	$1.731	$2.926	$6.453
Other	18.502	18.134	18.736
Streets and roads.	2.771	6.420	5.898
Other eng. constr..	9.648	15.720	9.214
Total	$32.652	$43.201	$40.302
Total, all classes Jan. 1 to Dec. 25:			
1930			$3.173.148
1929			3.950.315

Business Notes

CEMENT REFERENCE LABORATORY is now arranging for a second tour of inspection of cement-testing laboratories throughout the country. This service, which at present consists of inspecting cement-testing apparatus and demonstrating test methods, is rendered without charge. Laboratories which desire inspection should make prompt application to the Cement Reference Laboratory, U. S. Bureau of Standards, Washington, D. C.

AMERICAN STANDARDS ASSOCIATION, 29 West 39th St., New York City, has approved a standard for track bolts and nuts based on a study of different types used by railroads and electric railways in the United States and Canada. Copies can be obtained from the headquarters of the association.

LEIPZIG TRADE FAIR is to be held this year from March 1 to 7 at Leipzig, Germany. American participation is expected to include more than 100 exhibits and approximately 2,000 buyers from all parts of the country. American headquarters are at 11 West 42d St., New York City.

CATERPILLAR TRACTOR CO. has issued a general invitation to road builders to visit a comprehensive exhibit of machinery and equipment built by other manufacturers for use with Caterpillar tractors. This will be staged at the Peoria, Ill., plant of the company from Jan. 12 to 24, 1931.

DAYTON-DOWD CO., Quincy, Ill., has appointed J. B. Downey, Phoenix, Ariz., district sales representative for that state.

AMERICAN TRACTOR EQUIPMENT CO., Oakland, Calif., announces the appointment of N. G. Livingston as Eastern sales manager. Mr. Livingston will have his headquarters at the Peoria, Ill., plant of the company.

LINCOLN ELECTRIC CO., Cleveland, Ohio, has placed S. H. Taylor, Jr., in charge of the Pacific Coast territory, with headquarters in Los Angeles, Calif. He succeeds W. S. Stewart, recently appointed district manager of the Cleveland territory. Appointment of L. P. Henderson as manager of the San Francisco, Calif., office is also announced, as well as the appointment of E. J. Pfister as district manager at Kansas City, Mo.

WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa., will shortly start important changes and improvements at its South Philadelphia, Pa., works to provide for a conversion of part of the manufacturing space into a new shop for electric and oil-electric locomotive equipping and testing. Hitherto this work has been carried on at the East Pittsburgh works. Besides additions and alterations to existing buildings, the plans call for the improvement of 4 miles of railroad track, in conjunction with the Pennsylvania Railroad and the city of Philadelphia, to be used as a high-speed test track.

STERLING ENGINE CO., Buffalo, N. Y., has opened a New York City office in the Chrysler Building. William E. John is manager.

FULLER LEHIGH CO. is transferring all manufacturing operations from the plant at Fullerton, Pa., to the Barberton, Ohio, works of the Babcock & Wilcox Co. Management, engineering and sales departments will move to New York City. No definite date has been set for these changes, but it is expected that they will be made early in 1931. E. G. Bailey, president of the Fuller Lehigh Co., has been elected a vice-president of the Babcock & Wilcox Co.

MOON TRACK CO. has established a separate industrial division at its Chicago, Ill., office.

AMERICAN HOIST & DERRICK CO., St. Paul, Minn., has recently acquired additional warehouse facilities in Chicago which will enable it to carry complete stocks of new machines and repair parts.

FOOTE COMPANY, INC., Nunda, N. Y., has appointed Charles A. Lynch vice-president and general manager. Mr. Lynch was formerly manager of engineering and sales for the Fort Pitt Steel Castings Co., McKeesport, Pa.

PANGBORN CORP., Hagerstown, Md., has opened district sales offices in Cincinnati, Ohio, and Milwaukee, Wis. Thomas J. Dougherty has been appointed special sales engineer at the home office.

ARTHUR W. WILLCUTS, 48 years old, assistant manager of the railroad sales department for Joseph T. Ryerson & Son, Inc., at St. Louis, Mo., died on Dec. 13 of heart disease. He had lived in St. Louis ten years, coming from Detroit in 1920.

Unit Prices From Current Construction Bids

Steel Toll Bridge Over Ohio River at Ashland, Ky.

A CANTILEVER-TYPE bridge with steel viaduct and truss approaches and concrete masonry will be built over the Ohio River at Ashland, Ky., from the intersection of Winchester Ave. and Twelfth St. on the south to a connection with Ohio State Route No. 7 on the north, a length of 2,500 ft. It will have a 22-ft. roadway paved with rock asphalt on concrete base, and one 5-ft. sidewalk. The channel span is 739 ft. center to center of piers. The site is reached by the Chesapeake & Ohio Ry. at Ashland, or by the Norfolk & Western Ry. at Coal Grove, Ohio, or by the Ohio River.

Concrete for the foundations is of three classes: A, 1:2:4, 2,500 lb., used in reinforced abutments, wing-walls, piers, retaining walls, and concrete deposited in water (with cement increased 10 per cent); B, 1:2½:5, 2,000 lb., in footings for walls and piers; F, 1:2:3½, 2,800 lb., roadway slab and sidewalk on bridge. Substructure work includes construction of cofferdams, sheeting, or caissons, excavating to 6 in. below surrounding bedrock, driving precast concrete piles for the masonry, and all concrete work in caissons, footings, piers, pedestals and abutments. All construction joints in retaining walls are damp-proofed with Hydrolex or equal.

Superstructure work includes structural steel, anchorages, handrail, expansion-joint protection, anchor bolts, castings, bronze nameplates, and shop and field painting.

Unit prices are given of the lowest three bidders: Table I, A, The American Foundation Co., Cincinnati; B, Vang Construction Co., Pittsburgh (contract); C, General Contracting Corp., Pittsburgh. Table II, A, the Mount Vernon Bridge Co., Mount Vernon, Ohio (contract); B, Wisconsin Bridge & Iron Co., Chicago; C, Independent Bridge Co., Neville Island, Pittsburgh.

TABLE I—SUBSTRUCTURE

	A	B	C
1,300 cu.yd. fills	$2.75	$1.10	$5.00
1,400 lin.ft. precast con. piling	3.25	4.25	2.00
750 cu.yd. class B (1:7½) con. in footings for piers	44.00	50.00	37.00
200 cu.yd. class B in footings for walls	20.60	25.00	20.00
2,750 cu.yd. class A (1:6) con. in piers above foot'gs	19.00	20.00	24.50
200 cu.yd. class A con. in pedestals	17.00	24.00	21.00
250 cu.yd. class A con. in gravity walls	14.70	23.00	27.00
300 cu.yd. class A con. in c'nterfort walls and posts	21.50	31.00	38.00
350,000 lb. steel reinforcement	.03	.045	.05
8,000 sq.ft. waterproofing	.03	.10	.25
Totals	$121,760	$141,280	$150,275
Calendar days bid	150	180	180

TABLE II—SUPERSTRUCTURE

	A	B	C
1,270 cu.yd. class F (1:5½) con. roadway slab on bridge	$20.00	$22.50	$20.00
120 cu.yd. class F sidewalk on bridge	21.00	25.00	25.00
1,850 sq.ft. gunite sidewalk slab on bridge	.50	.50	.80
350,000 lb. steel reinforcement	.04	.034	.04
550 sq.yd. class A (1:6) con. roadway base on fills	2.50	4.00	3.00
110 sq.yd. class A (1:6) con. sidewalk on fills	1.80	2.00	2.00
230 lin.ft. class A (1:6) con. curb on fills	1.00	1.00	2.00
6,100 sq.yd. 1½ in. rock asphalt wearing surface	1.50	1.50	1.75
2,235,000 lb. silicon steel (cantilever bridge)	.064	.077	.073
3,300,000 lb. carbon steel (cantilever bridge)	.059	.0618	.066
850,000 lb. carbon steel (approach spans)	.049	.06	.063
Lighting system (lump sum)	3,300.00	3,350.00	2,830.00
Toll houses and canopy (lump sum)	1,700.00	4,000.00	3,200.00
Totals	$438,170	$490,565	$497,400
Calendar days bid	210	250	450

Prettyboy Dam and Bridge Across Gunpowder River, Md.

PRETTYBOY concrete dam on the Gunpowder River, Maryland, for the Baltimore bureau of water supply, was awarded in September, 1930, for $996,733. The dam is 486 ft. long and 141 ft. high; 133 ft. above the water surface. It is topped by a concrete-arch bridge 692½ ft. long. The bridge consists of a south approach of three 44-ft. spans, four 56-ft. arches with rises of 10 ft., a 38-ft. center span, four 56-ft. arches, and two 38-ft. approach spans on the north. Principal elevations are: springline, 525; crest, 520; water surface, 387; top of apron, 379.

Twenty-three bids were received; unit prices are given of the lowest three: A, J. A. LaPorte Corp., 109 State St., Albany (contract); B, York Engineering & Construction Co., 37 West Market St., York, Pa.; C, MacDonald Spencer Co., 1628 Graybar Bldg., New York.

Item 1 includes cofferdams, embankments, channels and other temporary structures for handling the river. The bid is lump sum and the tabulation shows the widest range. Clearing and grubbing, item 2, also is lump sum, and covers an area 500 ft. above the parallel to the upstream face of the dam and up to the 530 contour.

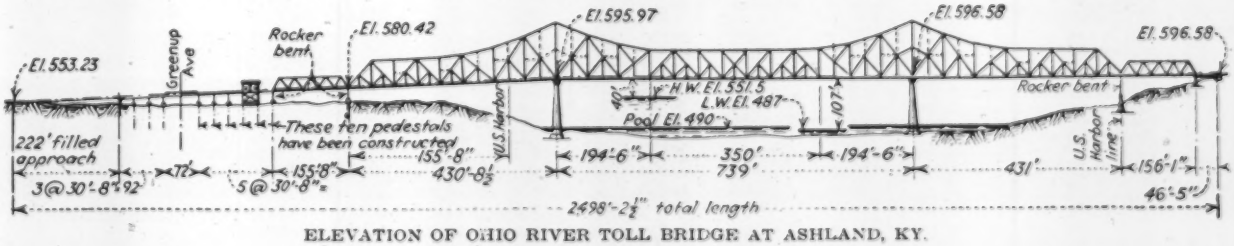
Items 3, 4 and 5 cover excavation. Common includes all except solid rock. Trench excavation includes all solid rock from the cutoff trench, and requires the use of channel machines. This trench is under the dam parallel to the upstream face for the full length. The grounds around the dam are to be made as attractive as possible, and to this end spoil banks are to be leveled and trimmed to regular lines.

Items 6, 7, and 8 are for concrete by volume as follows:

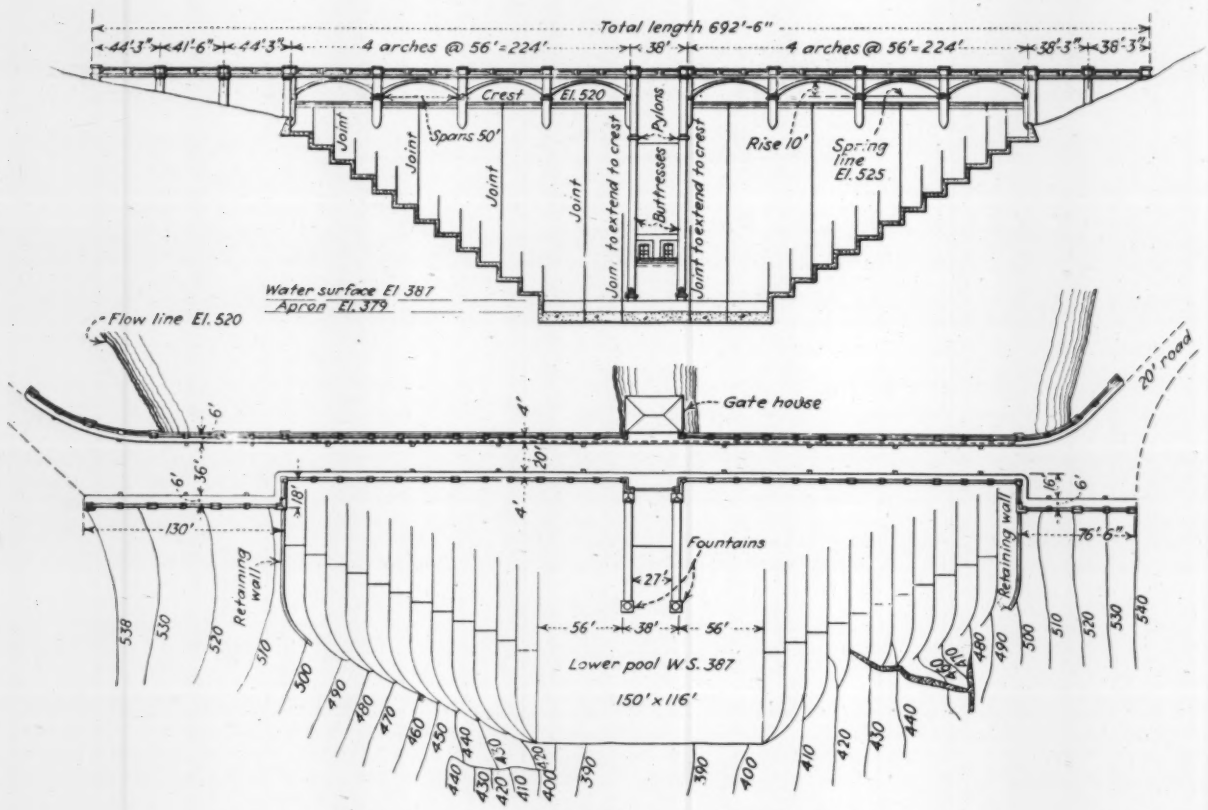
Class	Cement	Sand	Screenings	Stone	Cobbles	Water in Gal. Per Sack	Pounds in 28 Days
A	1	1½	½	3	0	6	3,000
B	1	1½	½	4	0	6½	2,500
C	1	2½	½	4½	3	8½	1,500

Cobble rock passes a 9 in. square or a 10 in. round opening and is retained on a screen having a 4½-in. or a 5-in. opening. After seven days all concrete must weigh 142 lb. per cubic foot. Class A concrete is for the arch ring, walls, columns, beams, girders, floor slabs, sidewalks and concrete in thin sections. Class B is for faces of mass concrete exposed to water or weather, and for road pavement. Class C is mass concrete.

Item 9 is special finish for sidewalks, floor of gate house, and stair treads. It consists of a stiff mortar of 1 part cement and 2 parts sand, and is laid 1 in. thick. Item 15



ELEVATION OF OHIO RIVER TOLL BRIDGE AT ASHLAND, KY.



PRETTYBOY DAM FOR BALTIMORE WATER SUPPLY

is for floor plates, ladders and other miscellaneous steel. Item 18 is for manhole frames and drain inlets. The cast-iron sluice gates (items 23-25) are 36x60 in., with leaf and frame faced with bronze.

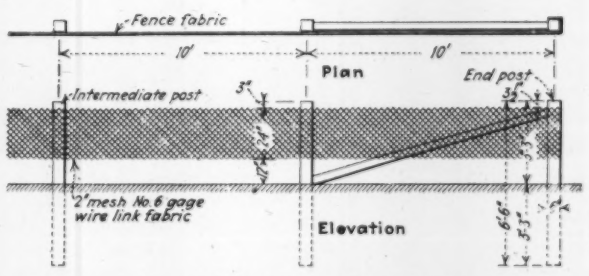
Item 26 is for gray Indiana limestone for the balustrade across the bridge. Item 29 covers filling with broken rock the space above the bridge arches between the spandrel walls up to the level of the concrete road base, each layer being compacted with heavy rammers and water. The contraction joint filler covered by item 32 is bituminous felt material ½ in. thick and 6 in. wide. All other items are lump sum.

		A	B	C
1	Stream control, (lump sum)	$2,500.00	$5,000.00	$16,725.00
2	Clearing and grubbing, (lump sum)	5,000.00	5,000.00	1,000.00
3	Common excavation, 25,000 cu.yd.	0.50	0.75	1.80
4	Rock excavation, 44,000 cu.yd.	2.50	1.00	2.40
5	Trench excavation, 2,000 cu.yd.	7.00	2.50	5.60
6	Concrete—class A, 2,600 cu.yd.	18.00	25.00	20.60
7	Concrete—class B, 29,000 cu.yd.	7.15	9.00	10.10
8	Concrete—class C, 78,000 cu.yd.	6.50	8.50	7.76
9	Surfacing floors, 1,200 sq.yd.	0.36	2.00	0.77
10	Drilling grout holes, 2,500 lin.ft.	0.30	0.10	0.50
11	Pipe for grouting, 1,200 lin.ft.	0.50	0.15	0.50
12	Pressure grouting, 2,000 bags, per bag	1.50	1.00	2.00
13	Steel reinforcement, 246,000 lb.	0.04	0.05	0.039
14	Contraction plates, 19,000 lb.	0.04	0.06	0.0575
15	Miscellaneous steel, 5,800 lb.	0.06	0.15	0.14
16	Screens, 21,100 lb.	0.06	0.12	0.07
17	Screen lifter, (lump sum)	400.00	300.00	186.00
18	Iron castings, 28,000 lb.	0.05	0.12	0.085
19	Stop plank guides, 58,000 lb.	0.06	0.12	0.09
20	Flange special castings, 30.5 ton	160.00	360.00	247.00
21	B. & S. special castings over 6 in., 24.0 ton	120.00	360.00	227.00
22	B. & S. pipe and specials, 4 and 6 in., 6.5 ton	130.00	100.00	237.00
23	Sluice gates, 106 ft. head, (4)	1,840.00	1,750.00	2,036.00
24	Sluice gates, 61 ft. head, (2)	986.00	1,300.00	1,597.00
25	Sluice gates, 16 ft. head (2)	708.00	800.00	903.00
26	Cut stone balustrade (lump sum)	25,000.00	30,000.00	20,000.00
27	Electric conduits, 2,900 lin.ft.	0.50	0.50	0.25
28	Setting conc. and needle valves, (4)	230.00	500.00	340.00
29	Fill on arches, 1,550 cu.yd.	2.75	2.00	4.00
30	Road surface, 3-in., 2,050 sq.yd.	0.80	3.00	1.50
31	Corrugated iron pipe, 100 lin.ft.	2.00	2.50	2.00
32	Contraction joint filler, 1,500 lin.ft.	0.12	0.10	0.20
33	Gate house superstructure, (lump sum)	10,000.00	14,000.00	10,000.00
34	Lighting system, (lump sum)	2,000.00	2,000.00	4,800.00
35	Fountains, (lump sum)	186.00	100.00	200.00
36	Needle valve inclosure, (lump sum)	300.00	1,000.00	500.00
37	Crane, (lump sum)	3,200.00	4,000.00	1,944.00
38	Bronze tablets, (lump sum)	250.00	250.00	325.00
39	Engineer's field office, (lump sum)	305.00	200.00	300.00
40	Oil heaters, (lump sum)	60.00	100.00	100.00
	Total	$996,733	$1,195,262	$1,237,496

Highway Fence in Akron

A CONTRACT for street improvement, awarded in Akron, Ohio, in November, 1930, included 200 lin.ft. of highway guard fence. Engineer's estimate was $2.50 per foot, as was the unit price of the successful contractor for the whole job. Average of the sixteen bids was $1.73 per linear foot. The fence fabric is 2-in. mesh, No. 6 gage wire link fabric, and the construction is shown on the accompanying drawing. The wood posts are 6½ ft. by 6 in. square and beveled, with the lower 4 ft. creosoted and the exposed wood given two coats of white lead and linseed oil.

The price of fence fabric of this kind is 22c. per foot in Akron.



CONSTRUCTION OF GUARD FENCE FORMING PART OF LARGE CONTRACT

CONSTRUCTION NEWS

Some of the Week's Large Projects

For further details turn to the appropriate sections in this issue

Location	Project	Cost	Status
Sewers			
Bay Shore (N.Y.)	Sewage disposal plant	$1,500,000	Proposed
Binghamton (N. Y.)	Sewer and sewage treatment plant	1,400,000	Proposed
Great Neck (N. Y.)	Sewage disposal plant	1,000,000	Proposed
Bridges			
Hartford (Conn.)	Bridge	5,000,000	Proposed
Tacoma (Wash.)	Bridge	8,000,000	Proposed
Airport			
Norwood, etc.	Airport	1,000,000	Proposed
Railways			
New York	Railway	1,192,000	Proposed
Subways and Tunnels			
Vancouver (B. C.)	Tunnel	1,535,000	Contract
Unclassified			
Trenton (N. J.)	Motor Speedway	2,000,000	Bids asked
Oswego (N. Y.)	Grain elevator	1,800,000	Contract
Fed. Gov't.			
New York	Post Office	1,000,000	Proposed
Buildings			
San Francisco	Shriners Temple	2,000,000	Proposed
Chicago	Club	1,200,000	Proposed
Rochester (N. Y.)	Club	1,000,000	Contract
Los Angeles	Hospital	1,000,000	Proposed
St. Louis	Hospital	1,000,000	Contract
Ogden (Utah)	Office	1,000,000	Proposed
Hackensack (N. J.)	County	1,200,000	Proposed
Auburn (N. Y.)	Prison	1,330,190	Contract
New York	Art Museum	3,350,000	Proposed
New York	Memorial	2,314,243	Contract
San Francisco	High School	1,500,000	Proposed
Elsah (Ill.)	College	3,500,000	Proposed
St. Louis	Merchandising Mart	2,500,000	Contract
Hershey (Pa.)	Community Center	2,000,000	Day labor and separate cont.
Washington	Theatre	1,000,000	Bids asked
New York	Theatre	1,000,000	Proposed
New York	Theatre and office	3,500,000	Proposed
Nashville (Tenn.)	Theatre and office	1,250,000	Proposed
Lakewood (N. J.)	Motion Picture Studio, etc.	1,000,000	Proposed
Mexico City	Hotel	4,000,000	Contract

WATERWORKS

PROPOSED WORK

Ind., Evansville—Waterworks improvements, $250,000. Work to be done at this time $100,000. Burns & McDonnell Eng. Co., 400 Interstate Bldg., Kansas City, Mo., engrs.

Minn., Duluth — E. W. Kelley, engr., c/o Water & Light Dpt., bids in January, retention basin for city water supply, $250,000.

Minn., Monterey—Village, waterworks, $15,000 bonds voted. W. E. Buell & Co., 501 Insurance Exch. Bldg., Sioux City, Ia., engrs.

N. H., Keene—City, sketches reservoir at Roaring Brook, Roxbury, $15,000 or more. B. B. Babbridge, City Hall, Keene, supt. Water Dpt.

N. J., Wayne—Wayne Twp. Com., Municipal Bldg., water distribution system, $100,000. T. F. Bowe, 110 William St., New York, consult. engr. Noted Dec. 11.

N. Y., Goshen—Village reservoir for water supply, $200,000-$300,000. H. B. Cleveland, 225 Bway., New York, engr. Noted Dec. 13.

N. Y., Gouverneur—Bd. Village Trustees, bids early in spring, filtration plant. A. Potter, 50 Church St., New York, consult. engr. Noted July 3.

N. Y., Mannsville—Waterworks, incl. 200,000 gal. standpipe, 11,800 lin.ft. 2- to 10-in. ci. pipe, 11 fire hydrants, $30,000. Whitford, Adcock, Lix & Ludgate Corp., Sietz Bldg., Syracuse, engrs. Noted July 10.

N. Y., Massapequa—Massapequa Dist. Water Comn., c/o Town Bd. or T. Fraser, Massapequa, reservoir and 27 mi. distribution lines, $360,000.

O., Cleveland—City, takes bids in Spring, repair work at Division Ave. filter house, $50,000. L. A. Quayle, City Hall, engr.

Pa., Greensburg—West Moreland Water Co. soon takes bids superstructure steel, etc., for rapid sand water filtration plant. To exceed $30,000. Supervising Engineers, Inc., 42 Cedar St., New York, engrs.

R. I., Barrington—Bristol and Warren Water Works Co., c/o Supervising Engineers, Inc., engrs., 42 Cedar St., New York, water distribution system. To exceed $100,000

Tex., Yoakum — City takes bids about February, light and power plant, incl. installing dynamo unit, extending lines, street lights, meters, $200,000. Montgomery & Ward, Harvey-Snider Bldg., Wichita Falls, engrs. Noted Dec. 11.

Utah, Logan—City Council, postponed taking bids to have been opened Nov. 28, 3,800 lin.ft. 20 in. c.i. supply line, $25,000. **Maturity in spring.** Noted Nov. 27.

W. Va., Moundsville—Bids in February or later waterworks improvements, incl. 1½ m.g.p.d. electric driven pumping plant, drilling wells, $50,000. D. Morrow, dist. mgr. for Supervising Engineers, Inc., 42 Cedar St., New York. Noted Sept. 24.

BIDS ASKED

Calif., Los Angeles—See "Streets and Roads."

Calif., Oakland—Jan. 5, by Directors East Bay Municipal Utility Dist., 50,000 ft. 6, 20 and 16 in. c.i. pipe, 500 valves, 6- to 16-in. inclusive for distributing system.

Md., Pikesville (br. Baltimore)—Dec. 31, by Bd. Awards, brick, tile, concrete automatic pumping station. E. G. Rost, Municipal Bldg., Baltimore, water engr.

N. J., Bound Brook—Dec. 30, by Mayor and Boro Council, 2,300 ft. 30- to 60-in. rein.-con. or 36- to 72-in. corrugated iron pipe for Brook Enclosure. F. S. Gould, Morecraft Bldg., Hamilton St., boro engr.; adv. E. N.-R. Dec. 25.

See proposal advertising on page 84

N. Y., Long Island City—Jan. 6, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in grounds Pumping Station 8, Alley Pond Park, Nassau and Kissena Blvds., Cherry, Elder and 43rd Aves., Main and 158th Sts., Queens Boro.

B. C., Burnaby—Jan. 15, by E. A. Cleveland, city engr., 500 Beatty St., 35,700 lin.ft. 20- to 36-in. rivited or electrically welded, lock bar, hammer welded or steel, cylinder concrete pipe for water mains, for Vancouver Water Dist. Comrs. $350,000.

B. C., Vancouver—"See Contracts Awarded."

CONTRACTS AWARDED

Calif., San Francisco—Water supply at Sunset Blvd., to E. J. Treacy, Call Bldg., $27,108.

Calif., Whittier—D. E. Allen, city clk., one deep well pump, installed in 24 in. well, to Wintroath Pumps Ltd., 1100 South Meridian St., Alhambra, $1,575 (5% discount); furnishing 143 ft. 30 in., 39 ft. 24 in. and 210 ft. 10 in. steel pipe, to Western Pipe & Steel Co., 5717 Santa Fe Ave., Los Angeles, $2,630; one 30 in. venturi style meter for City Water Dpt., to Natl. Meter Co., 2309 East 8th St., Los Angeles, $2,721. Grand total $6,926.

La., New Orleans—Sewerage & Water Bd., 526 Carondolet St., Contr. 106, altering Pumping Station 3, to C. N. Bott, Audubon Blvd., $5,997; furnishing 4 transformers to main purification plant, to Maloney Electric Co., Union Indemnity Bldg., New Orleans, and St. Louis, Mo., $2,082; labor and material on percentage basis for waterworks and sewerage construction for 1931, to J. M. McGowan, 1209 Joseph St., $0.012; lime for purification plant, to J. Watts Kearny & Sons, 514 South Peters St., $6.20 per ton; liquid chlorine for purification stations for 1931, to Arnold Hoffman & Co., Inc., 350 Madison Ave., New York, $5.15 per cwt.; sulphate of iron for purification stations for 1931, to Amer. Steel & Wire Co., 208 South La Salle St., Chicago, Ill., $13.45 per ton.

Mass., Worcester — Water Dpt., brick, steel, concrete pumping station at Quinapoxet Pond, to L. Rocheford & Son, Inc., 44 Front St., $14,770. Est. $15,000. Noted Dec. 4.

Mich., Detroit — Bd. Water Comrs., L. P. Fisher, pres. (2nd unit) 20 m.g. concrete water reservoir, 3 new rein.-con. walls on 3 sides, other side to be existing unit, to Bryant & Detwiler Co., 2806 Union Trust Bldg., $335,582. Noted Nov. 20.

Mich., Detroit—Dpt. Water Supply, electric conduit and lighting system for turbine house at Springwells Pumping Station, to Miller-York, Inc., 1523 East Congress St., $20,500.

N. Y., New Rochelle—New Rochelle Water Co., 7 m.g. reservoir, to Gannett, Seeley & Fleming, Inc., 600 North 22nd St., Harrisburg, Pa.

N. Y., Syracuse—City, 450 tons c.i. pipe for water line extensions, to R. D. Wood & Co., 400 Chestnut St., Phila., Pa., $25,715.

O., Dayton—Montgomery Co., Court House, waterworks, sewers for Moraine Sanitary Sewer and Water Dist., Sect. A, waterlines, pumping station and standpipe, to F. L. Krumholtz, 1020 Superior Ave., $78,000; Sect. B, water lines, to Boyd & Cook, Union Trust Bldg., $26,315; Sect. C, to C. J. Wetzel, 126 Otterbein Ave., $31,309. Grand total $135,615. Noted Nov. 27.

B. C., Richmond—Municipality, 315,000 3- to 12-in. lap welded steel pipe, bell and spigot with special rigid collar, to J. S. Tait & Co. Ltd., 500 Beatty St., Vancouver, representing Page-Hersey Tubes Ltd., 100 Church St., Toronto, Ont., $177,689. Noted Nov. 13.

B. C., Vancouver—Waterworks distribution system, day labor and city forces, $500,000 bonds voted for same. C. Brackenridge, city engr.

Ont., Hamilton—City Council, one 1,000 Imp. gal. g.p.m. fire pump, to Bickle Fire Engines Ltd., Woodstock, $14,950.

Ont., Newmarket—Town, 1 mi. c.i. watermain, day labor, under supervision W. J. Reilly, supt. $16,000. James, Proctor & Redfern, 36 Toronto St., Toronto, engrs. Supplying pipe, to Natl. Iron Corp., foot Cherry St., Toronto; hydrants, valves, to Kerr Engine Wks., Walkerville. Noted Dec. 11.

SEWERS

PROPOSED WORK

Calif., Los Angeles—Los Angeles Co., Hooper Avenue-Compton Creek Trunk Sewer, incl. 4 mi. 33 and 36 in. rein.-con. pipe $200,000; Downey-Bellflower Trunk Sewer Extension, 4 mi. 21 and

Constr. News page 257

LEADITE

Laying a 12-in. c. i. water main with LEADITE Joints, in a tight place.

It works well in Narrow Streets or Open Country

Whether the installation is 4-in. to 84-in. diameter bell and spigot water pipe, or whether the job is in tight places or open country, LEADITE is used to advantage for making the joints.

The merit of LEADITE as an excellent jointing material for this class of work, has been proven by its use for more than a quarter of a century, during which time thousands of miles of B. & S. pipe have been laid with LEADITE.

LEADITE continues to win friends and add many new names to its already long list of satisfied users and advocates.

Thousands of miles of bell and spigot water mains are jointed with LEADITE.

The pioneer self-caulking material for c. i. pipe.
Tested and used for over 30 years.
Saves at least 75%.

THE LEADITE COMPANY
Land Title Building - - - Philadelphia, Pa.

No Caulking

Sewers (Continued)

24 in. pipe; digester tanks at treatment plant, $100,000, all foregoing in County Sanitation Dist. 2, A. K. Warren, ch. engr. Co. Sanitation Dists.; 3 mi. or more concrete sewer in Co. Impvt. 757 and 770, Belvedere Sewerage System; 3 mi. or more sewers (type not determined) Co. Impvt. 967, Artesia; 2 mi. vitr. sewer with appurtenant structures, Co. Impvt. 874, The Strand, north of Manhattan Beach; vitr. clay sewers, Co. Impvt. 928, Hanover St., in Montebello Park, $50,000. County Sanitary Sewer Div. of County Surveyors Office, engrs.

Mass., Barnstable—Town Bd. Selectmen, sewerage works. $30,000.

N. J., Clifton—Bd. City Council, City Hall, preliminary plans storm water drains in Van Houten Ave. from Campbell Ave. to the brook, $35,000. J. L. Fitzgerald, city engr.

N. J., Newton—Town Comn., A. G. Vought, clk., extending Sparta and Clinton Street Sewage Treatment Works. Bids in. Will award contract about Jan. 1. Noted Oct. 30.

N. J., Oakhurst—Ocean Twp. Com., Township Hall, chlorination plant, foot Elberon Ave, $75,000. G. R. Moore, 603 Mattison Ave., Asbury Park, engr.

N. J., Paterson—Bd. P. Wks., City Hall, storm water and industrial drains in West Bway., Wood, North St. West, Lowe, Keen and Sherman Sts. $100,000 appropriated. H. J. Harder, city engr.

N. Y., Bay Sho.—Sewerage Comn., H. McWhorter, chn., sewage disposal plant. $1,500,000. **Maturity in spring.** A. J. Provost, Jr., 41 West 38th St., New York, engr. Noted Dec. 20, 1928.

N. Y., Binghamton—Sewer and sewage treatment plant. $1,400,000. **Maturity in spring.** Fuller & McClintock, 170 Bway., New York, engrs. Noted Dec. 19.

N. Y., Great Neck—Village, sewage disposal plant. $1,000,000. **Maturity in spring.** Fuller & McClintock, 170 Bway., New York, engrs. Noted Apr. 3.

N. Y., Johnson City—Bd. Village Trustees, sewerage system, disposal plant. **Maturity after Feb. 1.** Fuller & McClintock, 170 Bway., New York, engrs. Noted Dec. 19.

N. Y., New Rochelle—Dpt. P. Wks., sewers, $1,000,000. **Maturity in summer.** Noted Dec. 19, 1929.

N. Y., Rochester—Common Council, H. W. Baker, comr. P. Wks., sanitary and storm sewers in Chesterfield Dr., Tupper St. and Denise Rd., $200,000; storm water outlet sewer in Dunn Strand, $75,000; sewer, asphalt paving Lehr Alley, $7,500.

Pa., Natrona — Bd. Comrs. Harrison Twp., Town Hall, 41 Chestnut St., rejected bids Dec. 10, 3.25 mi. 15 in. terra cotta or concrete sewer, 600 ft. 16 in. c.i. pipe for 12 creek crossings, 60 or 70 brick manholes, siphon chamber at Bull Creek end, 500 g.p.m. vertical shaft centrifugal non clogging pump and motor, beginning at Tarentum, running along Little Bull Creek Valley, $75,000. Will probably readvertise. C. E. Miller, Jenkins Arcade, Pittsburgh, engr. Noted Dec. 4.

Que., Aylmer—Town Council, soon takes bids sewers, paving, $45,000.

BIDS ASKED

Calif., Los Angeles—See "Streets and Roads."

Calif., Madera—Jan. 5, by City Council, sewage disposal plant. Former bids rejected.

Ill., Chicago—Jan. 22, by R. A. Woodhull, chn. com. Sanitary Dist. of Chicago, 910 South Michigan Ave., West Side Sewage Treatment Works, Div. Z. Imhoff tanks, Battery C; adv. E. N.-R. Dec. 25.

La., Donaldsonville — Bids about Jan. 15, complete sewerage system, disposal plant. J. W. Billingsley, Interstate Bank Bldg., New Orleans, engr. Noted Oct. 30.

La., New Orleans — Feb. 4, by Bd. Comrs. Sewerage & Water Bd., 526 Carondolet St., five 36 in. horizontal swing check valves—flange ends, one 36 in. gate valve-bell ends—hydraulic operated cylinder; two 36 in. gate valves—flange ends—bevel geared handwheel, one 60 in. gate valve—flange ends—electric motor control. Contr. 209-S.

N. Y., Orangeburg—Dec. 30, by Dpt. Mental Hygiene, State Office Bldg., Albany, sewers, water lines at Rockland State Hospital.

N. Y., Rye — Jan. 9, by Westchester Co. Sanitary Sewer Comn., E. S. Martin, secy., Court House Annex, White Plains, 900-1,400 ft. 18 in. c.i. sewer in Sect. G Blind Brook Project; adv. E. N.-R. Dec. 25.

Tenn., Knoxville—Dec. 29, by W. W. Mynatt, dir. Pub. Serv., Broadway Laterals No. 2, incl. 69,916 lin.ft. 8- to 12-in. sewers, wyes, manholes. $125,000. H. J. Wight, city engr.

B. C., Vancouver—See "Contracts Awarded."

Ont., Port Colborne — See "Contracts Awarded."

Ont., Waterloo—See "Contracts Awarded."

CONTRACTS AWARDED

Kan., Lawrence—O. H. Stockwell, city clk., West Lawrence Lateral Sanitary Sewer Dist. 1, 1,407 ft. 10 in. and 13,439 ft. 8 in. vitr. clay pipe in place, 120 ft. 10 in. c.i. pipe, 325 wyes, 12 standard flush tanks, 45 manholes, 900 ft. 3 in. galvanized pipe, 12 service water taps, to March Constr. Co., 941 Kentucky St., $21,256.

La., New Orleans—Bd. Comrs. Sewerage & Water Bd., 526 Carondolet St., Contr. 109-S, furnishing c.i. pipe, fittings, to U. S. Cast Iron Pipe & Fdry. Co., Amer. Trust Natl. Bank Bldg., Birmingham, Ala., $124,436; Contr. 110-S, c.i. sewage discharge mains in Algiers St. and c.i. pressure main for sewage and dry weather flow in Iafitte Ave., to T. H. Brockman, Canal Bank Bldg., 1406 Rendon St., $65,256.

Mass., Boston—Dpt. P. Wks., sewerage works in Pleasanton St., Roxbury, to P. Guarino, 5 West Cottage St., Roxbury, $15,627; Albany St., Roxbury, to A. Singarella, 22A Tremlett St., Dorchester, $10,489. Noted Dec. 4.

Mich., Detroit—Dpt. P. Wks., Lateral No. 5627, Arm in 2nd Ave. from Pingree to Webb Aves., to A. Rossi, 24001 Seven Mile Rd., $51,339; Lateral 5629, in Duncan and Lambert Aves. from Fisher to Rohns Ave., to Furnari Excavating Co., 14554 Grand River Ave., $3,800; Lateral 5619 in Forest Ave. from Belvidere to Cooper Sts., to Waterway Constr. Co., Sherwood and Rinke Rds., $4,700. Grand total $59,839.

Mich., Detroit—Dpt. P. Wks., Pallister Seward Relief Sewer in Pallister and Seward Sts., and 2nd St. from Woodward to 12th Sts., 6,370 ft. 6 ft. cylinder and 2 ft. 10 in. x 4 ft. 3 in. egg section, two-ring brick, to R. D. Baker, 15440 West Seven Mile Rd., $89,468; 933 ft. 3 ft. 6 in. cylinder and 24 in. crock sewer in Freud Ave. Arm west of Lycaset Ave., to Blanck & Gargaro, 40 Seven Mile Rd. E., $11,207; 637 ft. 3 ft. cylinder in Avondale Arm west of Newport Ave., to Mancini Constr. Co., Meyers Rd., $6,656. Grand total $107,331.

N. Y., Rome—Bd. Estimate & Contr., sewerage development, to A. DiMarco, 1 South Kensico Ave., White Plains, $202,700. Noted Dec. 15.

O., Cleveland—City, 1,139 ft. 5 ft. 9 in. Circular C brick sewer in East Blvd. from Union to Regalia Aves., to M. P. Nero & Patrick Constr. Co., Citizens Bldg., $31,902; 2,694 ft. 4 ft. 6 in. to 7 ft. Circular E sewer and 2,694 ft. 6 in. underdrains in Lakeside Ave. from Marquette to East 43rd Sts., to D. Nero, 1424 Lakeview Rd., $67,932.

Tex., Refugio—City, c/o J. O. West, mayor, disposal plant, sewerage system, incl. settling tank, sprinkling filter, to Kirkwood, Wharton & Lee, San Antonio, $42,000. Est. $60,000. Noted Dec. 11.

B. C., Vancouver—Sewer improvements, day labor and city forces. $750,000 bonds voted for same. C. Brackenridge, city engr.

Ont., Hamilton — For 6,972 lin.ft. 27- to 36-in. concrete sewer pipe, to A. Cope & Sons Ltd., 29 Albert St., $16,372.

Ont., Ottawa—For 2,400 ft. 84 in. concrete pipe for King Edward Ave. Sewer, to Lock Joint Pipe Co. Ltd., Montreal, Que., $34,680.

Ont., Owen Sound—For 5,000 lin.ft. 9 in. vitr. clay sewers, day labor. $25,000. R. C. McKnight, city engr.

Ont., Peterborough—For 2 mi. 8 in. and up vitr. tile storm sewer, day labor. $56,198. R. H. Parsons, city engr. Noted Oct. 23.

Ont., Port Colborne—Town, 2.5 mi. sanitary and storm sewers in northeast portion, day labor. $60,000. T. S. Scott, city engr.

Ont., Waterloo—Town, 4,200 lin.ft. 24 in. tile outlet sewer from Erb St., to Grand River, day labor. $34,000. James, Proctor & Redfern, 36 Toronto St., Toronto, consult. engrs. C. E. Necker, Waterloo, city engr.

WASTE DISPOSAL

PROPOSED WORK

Mass., Worcester—City, Mayor's Office, City Hall, incinerator. $200,000. Metcalf & Eddy, Statler Bldg., Boston, engrs.

BRIDGES

PROPOSED WORK

Calif., Santa Rosa—Bd. Comrs. Sonoma Co., replacing present structure with 140 ft. steel truss bridge over Sonoma Creek, near Sonoma State Home. E. A. Peugh, Santa Rosa, co. surv.

Connecticut—State Hy. Dpt., Hartford, 3 span, concrete, steel bridge, main span 854 ft. long, 1,500 ft. and 7,500 ft. approaches, four-lane granite constructed roadway over Connecticut River between Hartford and East Hartford; also 2 small bridges over Hockanum River. $5,000,000. C. W. Hudson, 15 Park Row, New York, engr.

Conn., Milford — State Hy. Dpt., Hartford, steel, concrete railroad bridge, Washington St. $200,000. E. C. Weldon, hy. comr.

D. C., Wash.—District Comrs., Dpt. Hys., District Bldg., bids in February, bridge over Klingle Valley, Modjeski, Masters & Chase, 1420 Walnut St., Phila., Pa., consult. engrs.

Idaho, Boise—State Hy. Comn., Boise, J. D. Wood, comr., 300 ft. rein.-con. bridge over Boise River.

Md., Baltimore—For 1,375 ft. concrete, steel bridge, 40 ft. roadway, 29th St. H. L. Lucke, Municipal Office Bldg., bridge div. engr.

Md., Baltimore—Bd. Awards, bridge to carry Baltimore St. over Gwynn's Falls Valley, starting at Ellicott Driveway on east bank valley of the falls, passing under Pennsylvania Railroad bridge and over Western Maryland Ry. on west bank, continuing to Hilton St. $400,000. H. F. Lucke, Jr., city bridge engr. N. L. Smith, hys. engr.

Mo., Boonville—Missouri, Kansas & Texas R.R. Co., F. Ringer, ch. engr., Railway Exch. Bldg., St. Louis, bids in spring superstructure 4 span bridge over Mississippi River and Missouri Pacific tracks.

N. J., Elizabeth—Bd. Freeholders Union Co., Court House, bids in January, on sub-structure and superstructure bridge. $150,000. Ash, Howard, Needles & Tammen, 55 Liberty St., New York, engrs. Noted June 19.

Virginia—Portsmouth-Norfolk County Bridge & Tunnel Authority V. A. Brooks, chn., either bridge or tunnel connecting Portsmouth and Norfolk. **Maturity after Mar. 1.** Klapp-Brickerhoff & Douglass, 84 Pine St., New York, engrs. for tunnel. Noted May 16, 1929.

Wash., Tacoma—City bridge over Narrows, $8,000,000. **Maturity in spring.** Robinson & Steinman, 117 Liberty St., New York, engrs. Noted Mar. 7, 1929.

West Virginia—See "Contracts Awarded."

BIDS ASKED

Alabama—Jan. 6, by State Hy. Comn., Montgomery, 75 ft. bridge, Rd. 3, Hartselle—150 ft. bridge, Rd. 8, Benton—150 ft. bridge over Persimmon Creek, at Greenville—375 ft. bridge over Tallapoosa River, Rd. 1, at Talladega—416 ft. bridge over Locust Fork of Warrior River on Birmingham-Jasper Rd., Jefferson Co., all steel, concrete, W. Finnell, hy. dir.

Indiana and Illinois — Jan. 20, by Indiana State Hy. Comn., Indianapolis, J. J. Brown, dir., and Illinois Dpt. P. Wks. & Buildings, Div. Hys., Springfield, F. T. Sheets, ch. engr., bridge over Wabash River, at Vincennes, Ind. $600,000.

Iowa—Jan. 6, by State Hy. Comn., Ames, 32 x 24 ft. I-beam bridge, 90 x 20 ft. pony truss bridge with two 40 x 20 ft. approach spans, raising 80 x 20 ft. pony truss bridge, extending 20 ft. slab bridge, 86 culverts, extensions, Rd. 71, Federal Aid Project 154. 4 culverts, extensions on Templeton Rd., B-713, all Carroll Co.—100 x 20 ft. high truss bridge, 36 culverts, extensions, Rd. 2, Federal Aid Project 327, Madison Co.—one 16 x 24 ft., one 40 x 24 ft. I-beam bridges, 42 culverts, Rd. 4, B-645, Pottawattamie Co. — two 32 x 20 ft. span I-beam bridge, 80 x 20 ft. span deck truss bridge with two 40 x 20 ft. I-beam approach spans, 28 culverts, extensions, Rd. 5, B-676, Webster Co.—9 culverts, extensions, Federal Aid Project 256, Adair Co.—216 ft. cantilevered steel arch railroad crossing with 24 ft. roadway, two 5 ft. sidewalks, Rd. 169, X-944, Union Co. C. R. Jones, aud.

Ia., Waterloo — Dec. 29, by City, 758 ft. bridge, incl. four 51 ft. 6 in. steel truss main spans, two 38 ft. rein.-con. girder approach spans on each end, 24 ft. roadway, two 5 ft. sidewalks, at 18th St. $104,397. N. Barber, city engr. Marsh Eng. Co., 205 Masonic Temple Bldg., Des Moines, consult. engrs.

Louisiana — Jan. 6, by State Hy. Comn., Baton Rouge, bridges on Oak-Grove Mer Rouge Rd., Route 11, West Carroll and Morehouse Parishes—Tangipahoa River Bridge, Kentwood-Sunny Hill Rd., Route 71, Tangipahoa Parish—Red River Bridge, Archie-Marksville Rd., Route 57, Avoyelles Parish — Amite River Bridge, Baton Rouge-Hammond Rd., Route 7, East Baton Rouge and Livingston Parishes — Red River Bridge, Coushatta-Mansfield Rd., Route 9, Red River Parish—Buoge Chitto River Bridge, Covington-Bogalusa Rd., Route 7, St. Tammany Parish. H. B. Henderlite, hy. engr.

Michigan—Dec. 30, by Saginaw Co. Road Comn., Saginaw, State Reward Br. 1 of 73-17-24C-2 and 3, 2 rein.-con. abutments, steel deck girder bridge, rolled steel sections for State Hy. Comn., Lansing. C. A. Miller, Saginaw, division bridge engr.

Michigan—Dec. 31, by H. F. Anderson, division Bridge Engr., Cadillac, MB 1 of 28-5-1 Cont. 3 and 4, 2 rein.-con. abutments, steel deck girder bridge, rein.-con. flooring, railing, Grand Traverse Co., for State Hy. Comn., Lansing.

N. J., Mantoloking—Bd. Freeholders Ocean Co., Court House, Toms River, bids about Jan. 5, creosoted timber, concrete pile bridge with jackknife draw across Branagat Bay between Mantoloking and West Mantoloking. $200,000. H. C. Shinn, Municipal Bldg., Lakewood, co. engr. Noted Nov. 27.

N. J., Palisades Park—Jan. 5, by State Hy. Comn., Trenton, bridge on Route 6, Sect. 3, across Route S-1, Bergen Co. A. L. Grover, ch. engr.

New York—Jan. 5, by A. Goldman, comr. Plant & Structures, Municipal Bldg., New York, Wards Island Anchorage of Triborough Bridge connecting Manhattan, Bronx and Queens Boros.

N. D., Dazey—Dec. 29, by State Hy. Comn., Bismarck, rein.-con. bridge east of here, Barnes Co. To exceed $25,000.

O., Cleveland—See "Materials."

Pa., Butler—Jan. 3, by B. D. Stone, ch. clk. Bd. Comrs. Butler Co., Court House, 122 ft. steel, concrete girder bridge on piers abutments, 30 ft. roadway, 5 ft. 6 in. sidewalks over Connoquenessing Creek. $50,000. J. Farris, Empire Bldg., Pittsburgh, engr.

Pa., Reading—Bd. Comrs. Berks Co. bids about Mar. 1, concrete, steel bridge. $450,000. W. Mueser, 21 Park Row, New York, engr. Noted Jan. 23.

Virginia—Jan. 6, by Dpt. Hys., Richmond, steel, rein.-con. bridges, Route 12, Project 566B-1 and 2, Brunswick Co.; adv. E. N.-R. Dec. 25.

Constr. News page 257a

Bridges (Continued)

Calif., San Diego—State Hy. Comn., Sacramento, superstructure for steel bridge to have 350 ft. steel arch span, one 82.114 ft., one 79 ft., two 62 ft. and one 44 ft. plate girder spans over Western Pacific R.R. and North Fork Feather River, to J. H. Pomeroy & Co., Inc., 251 Kearney St., San Francisco, $138,848. Noted Nov. 20.

Indiana and Illinois — Indiana State Hy. Comn., Indianapolis, J. J. Brown, Dir., and Illinois Dpt. P. Wks. & Buildings, Div. Hys., Springfield, F. T. Sheets, ch. engr., at office Div. Hys., Springfield, Ill., twelve-span 225 ft. steel bridge, 11 concrete piers, 2 concrete abutments, rein.-con. flooring over Wabash River at Mt. Carmel, Ill., between Indiana and Illinois, to Vincennes Bridge Co., Vincennes, Ind., $399,414. Est. $700,000. Noted Nov. 20.

Indiana and Kentucky—J. J. Brown, dir. State Hy. Comn., Indianapolis, Ind., Contr. 4, metal work in superstructure, paving roadway on metal work, incl. 1,575,000 lb. metal work in I-beam spans, 850,000 lb. metal work in deck plate girder spans, 2,400,000 lb. metal work in deck truss spans, 750,000 lb. reinforcing steel, 10,300 sq.yd. concrete roadway paving for bridge over Ohio River from Evansville, Ind., to Henderson, Ky., to Globe Constr. Co., 6 West Side Bank Bldg., Evansville, Ind., $260,750. Est. $356,575. Noted Dec. 4.

Mass., Revere—Dpt. P. Wks., State House, Boston, 4,500 ft. steel, rein.-con. bridge, stone facing, bituminous macadam approaches, to M. McDonough, Saugus, $158,317. Noted Dec. 11.

North Carolina—State Hy. Comn., Raleigh, steel, rein.-con. bridge, State Aid Project 2060, Craven Co., to Austin Bros. Bridge Co., 1195 Mickleberry St., Atlanta, Ga., $71,465. Noted Nov. 27.

Tex., Christoval—Comrs. Court Tom Green Co., c/o County Auditor, 500 ft. rein.-con. bridge over Concho River, Oakes St., to W. H. Thompson, San Angelo, $81,311. Noted Nov. 20.

Washington—S. J. Humes, dir. Hys., Olympia, steel, rein.-con., bridge over Walla Walla River and North Pacific R.R., to Colonial Building Co., 617 Hutton Bldg., Spokane, $39,710; crushed stone surfacing 20.5 mi. road in Grays Harbor Co., to F. G. Redmon, 206 South 4th St., Yakima, $8,665. Noted Nov. 20.

West Virginia—State Road Comn., Charleston, Vinson Bridge 1253, Mingo Co., to Price Constr. Co., Huntington, $51,867—Guano Creek Bridge 1251, Putnam Co., to Spencer Constr. Co., Spencer, $12,762—Davis Bridge 1213, Tucker Co., to West Virginia Bridge Co., Spencer, $7,181—grading, drainage structures in Marion Co., to W. H. Armstrong & Co., Fairmont, $28,193—guard rail in Brooke and Hancock Counties, to Morris & Riggs, Sistersville, $9,750. Grand total $109,754. Rejected bids guard rail in Marshall and Wetzel Counties. Noted Nov. 6.

W. Va., Weirton—State, City and Hancock Co., steel span overhead bridge, near here, to Ferguson, Edmondson, Keystone Contg. Co., Keystone Bldg., Pittsburgh, Pa., $375,000. Est. $400,000.

Que., Quebec City—City Council, bridge over St. Charles River, connecting Henderson St. with Limorton St., to Eastern Canada Steel & Iron Wks., Quebec City, $326,000.

STREETS AND ROADS

BIDS ASKED

Alabama—Jan. 14, by State Hy. Comn., grading, guard rails, grass planting, 7 in. concrete or bituminous surface courses on Portland concrete base paving 19 mi. hy. Jefferson and St. Clair Counties, 18 ft. W. Finnell, hy. dir.

Alabama — Jan. 15, by State Hy. Comn., Montgomery 7 in. concrete paving 1/3 mi. Brandon Hy., unpaved gap, Butler Co., and 2.02 mi. Atlanta Hy., just outside town of Tuskegee, Macon Co., both 18 ft. W. Finnell, hy. dir.

Alabama — Jan. 17, by State Hy. Comn., Montgomery, 7 in. concrete paving 17 mi. Montgomery-Mobile Hy., Escambia Co., 18 ft. W. Finnell, hy. dir.

California—Jan. 7, by Imperial-San Diego Co. Joint Hy. Dist. 17, grading, overhauling, dyking, headwall, corrugated culverts 25.41 mi. (1st unit) Julian-Kane Springs Rd. To exceed $275,000. E. R. Childs, Court House, San Diego, engr.

Calif., Los Angeles—Dec. 31, by Bd. P. Wks., City Hall, grading, curbing, sidewalks, storm drains, sanitary sewers 4 and 6 in. concrete paving San Marco Dr. and Lorenzo Dr. Impvt. Dist. Former bids rejected. To exceed $25,000.

Calif., Los Angeles—Dec. 31, by Bd. P. Wks., City Hall, grading, storm drains, water system, 8 in. National on 6 in. asphaltic concrete paving 175,000 sq.ft. Moorpark St.

Calif., Newport Beach—Jan. 5, by City Council, drainage structures, 6 and 8 in. vitr. sewers, 4 in. concrete paving 140,000 sq.yd. River Ave.

Calif., Oakland—Dec. 31, by F. C. Merritt, city clk., grading, curbing, rein.-con. pipe conduit, concrete paving 105,695 sq.yd. Hampton Rd., Liggett Dr., et al.

Ind., Boonville—Jan. 5, by Bd. Comrs. Warrick Co., improving Philip Hoffman et al. Rd. $64,000. E. Bracher, aud.

Constr. News page 258

Ind., Warsaw—Dec. 27, by Bd. Comrs. Kosciusko Co., grading, concrete surfacing 4.63 mi. Jesse B. Marion, et al. Rd., Plain Twp., $90,892—3.19 mi. Oder Arnold, et al. Rd., Clay Twp., $72,608—grading, gravel surfacing 2.7 mi. Kary E. Day, et al. Rd., Franklin Twp., $15,481. H. B. Helvey, Warsaw, co. aud.

Iowa—Jan. 6, by State Hy. Comn., Ames, grading, flumes, paving 4.399 mi. Rd. 2, F-259, Adair Co.—26.306 mi. Rd. 71, F-154 and 1.534 mi. Rd. 71, P-713, both Carroll Co.—11.795 mi. Rd. 2, F-327, Madison Co.—6.93 mi. Rd. 48, P-607, Montgomery Co.—14.485 mi. Rd. 4, F-322, Shelby Co.—12.7 mi. Rd. 5, P. 670, Webster Co.—gravel surfacing 9.615 mi. Rd. 137, P-526 Lucas Co.—0.73 mi. Rd. 6, P-663 Marion Co.—15.76 mi. Rd. 16, P-613 Ringgold Co.—7.788 mi. Rd. 148, P-363 Taylor Co.—11.892 mi. Rd. 137, P-728 Warren Co.—130,530 lin.ft. cable guard rail complete, 1,130 end anchors, state to furnish posts and 10,400 lin.ft. cable. Dist. 5—247,530 lin.ft. cable guard rail complete, 1,696 end anchors, contractor to furnish materials and labor. Dist. 7—378 cu.yd. riprap in place, 300 cu.yd. excav. Rd. 59, F-257 and 319 cu.yd. riprap in place, Rd. 30, F-303 Tama Co. C. R. Jones, aud.

Louisiana—Jan. 6, by State Hy. Comn., Baton Rouge, asphaltic concrete (crushed limestone mix), surfacing 26 mi. Jena-Harrisonburg Hy., La Salle and Catoula Parishes, surface treating 20 mi. Leesville-Simpson Hy., Vernon Parish. H. B. Henderlite, ch. engr.

Maryland—Dec. 30, by State Roads Comn., Baltimore, G. C. Uhl, chn., concrete paving 2.71 mi. Contr. AA-105-72, Federal Aid Project 214B, Anne Arundel Co.

Md., Baltimore—Dec. 31, by Bd. Awards, cement concrete base paving 12,000 sq.yd. streets listed in Contr. 567. N. L. Smith, Municipal Bldg., hys. engr.

Mass., Lynn—See "Contracts Awarded."

Mass., Woburn—See "Contracts Awarded."

Mo., St. Louis—City bids about June 1, grading, curbing, 1.5 mi. Riverview Dr. from Bway. to St. Cyr Ave. $58,300. W. W. Horner, city engr.

N. Y., Brooklyn—Dec. 29, by H. Hesterberg, pres. Brooklyn Boro, Boro Hall, grading, asphalt on 6 in. concrete paving East 38th St. and Georgia Ave.; curbing, flagging Avenue L, Lincoln Ave., East 27th, East 38th, East 95th Sts.

North Dakota—Dec. 29, by State Hy. Comn., Bismarck, grading 24.44 mi. McIntosh Co., 15.914 mi. Steele Co.—12.133 mi. Oliver Co.—12.399 mi. Barnes Co.—graveling 9.926 mi. Nelson Co.—regraveling 10.933 mi. Nelson Co.—12.187 mi. Towner Co.— Scoria surfacing 12.341 mi. Golden Valley Co. $236,000.

Tex., Beaumont—R. C. Black, engr., City Hall, taking bids and open same about Jan. 5, widening, paving 12 blocks Broadway St. and Madison St. $60,000.

Tex., Sweetwater — Taking bids and opens same about Jan. 1, alternate types paving 12 blocks West 1st, Sam Houston and 12th Sts. $30,000. Address S. R. Bothwell, city mgr.

Tex., Waco—City and J. H. Strange, engr., c/o City Hall, taking bids and open same about Jan. 1, rein.-con. or asphalt on concrete paving 10 blocks Jefferson Ave. from Riverside Dr. to 10th St., 30 ft. $55,000.

Wash., Everett—Comrs. Snohomish Co., bids in January, 4 mi. road and steel bridge on Machias-Lake Roesiger Rd., $35,000; bids early in 1931, 4.5 mi. road and steel, concrete bridge over Merrill and Ring Gulch, on Mukilteo-Everett Hy. $55,000. R. D. Alverson, co. engr.

CONTRACTS AWARDED

Alabama—State Hy. Comn., Montgomery, 7 in. concrete paving 10.99 mi. Bessemer-Tuscaloosa Hy., Jefferson Co., 18 ft., to Morgan-Hill Paving Co., Woodward Bldg., Birmingham, $180,000.

Alabama—State Hy. Dpt., Montgomery, concrete paving 27 mi., Mobile Co., to Couch Constr. Co., Dothan, $406,000. State furnishes cement. Noted Nov. 27.

Arizona—State Hy. Comn., Phoenix, grading, concrete paving 2.73 mi. Florence-Tucson Rd., to Stanley Jaicks Co., Tucson, $77,083. Noted Nov. 28.

Ark., Bearden—Paving 1 mi. Main St., to C. L. Beasler, Hot Springs, $30,000.

Calif., Oakland — Grading, curbing, walks, concrete paving 270,020 sq.ft. Hopkins St. Pl., to Heafey-Moore Co., 344 High St., $83,500. Noted Nov. 27.

Calif., San Francisco—S. J. Hester, secy. Bd. P. Wks., City Hall, asphalt and emulsified asphalt paving Lawton St. (Golden Gate Heights), to Calif. Constr. Co., Standard Oil Bldg., Los Angeles, $45,081. Noted Nov. 20.

Colorado—State Hy. Dpt., Denver, gravel surfacing 1.93 mi. La Plata Co., to Grant Shields Constr. Co., Bayfield, $29,456—4.63 mi. Moffat Co., to N. M. Monoghan, Denver, $73,182—10.122 mi. Sedgwick Co., to J. F Roberts & Sons, Tramway Bldg., Denver, $15,103 — oil processed gravel surfacing 15.967 mi. Cheyenne Co., to W. F. Pigg & Son., Commonwealth Bldg., Denver, $116,829. Grand total $234,570. Noted Nov. 27.

Idaho — J. D. Wood, comr. P. Wks., Boise, grading, graveling 5.77 mi. Idaho-Montana Hy., Clark Co., to Sutherland & Burns, Missoula, Mont., $35,554. Est. $43,825. Noted Nov. 27.

La., Lake Charles—City Council and Missouri-Pacific R.R. Co., Missouri-Pacific Bldg., St. Louis, Mo., E. A. Hadley, ch. engr., 6 in. rein.-con. paving 7,683 sq.yd., to Barber Bros., Bogolusa, $19,420. Noted Nov. 13.

La., Tallulah — Madison Parish, grading, culverts, gravel surfacing 11 mi. Trinidad-King-Afton Rd., to Forgy, Hanson & McCorkle, Opelousas, $23,707.

Mass., Lynn—Widening City Hall Sq., separate contracts. To exceed $25,000. F. Gowdey, city engr.

Mass., Mattapan (sta. Boston)—City, Hospital Dpt., 2 driveways, sidewalks at hospital, to J. H. Sullivan Co., 18 Lake St., Brighton, $26,325.

Mass., Woburn—Bituminous macadam paving Eastern Ave. and Fairmount St. $25,000 to $30,000, day labor. H. V. Macksey, City Hall, supt. P. Wks. Dpt.

Michigan — R. W. Roberts, resident engr., Saginaw, grading, draining, concrete paving 7.986 mi. FO25-25C-1, Genesee Co., to J. Porath, 903 Transportation Bldg., Detroit, for State Hy. Comn., Lansing, $252,580. Noted Oct. 23.

Mo., Clayton—St. Louis Co., grading, rein.-con. paving 6,850 ft. Big Bend Rd., 20 ft., to C. A. Moreno, Syndicate Trust Bldg., St. Louis, $72,149. Est. $90,917. Noted Dec. 18 Daily.

Mo., Kansas City—Park Bd., City Hall, grading 71st St. Blvd., to H. Spitcaufsky, 3229 Victor St., $105,781.

Neb., Omaha—Douglas Co., concrete paving 11,966 sq.yd. and 2,000 ft. expansion joints, Locust St., to National Constr. Co., 305 Arthur Bldg., at $1.58 per sq.yd. and $0.06 per ft. respectively.

N Y., Albany—Bd. Contr. & Supply, City Hall, improving Highland Ave. from New Scotland Ave. to Hackett Blvd., to E. B. Stevenson, 443 Bway., $77,808. Noted Dec. 4 Daily.

N. Y., New York—Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, constructing trunk line Rice Memorial Park, to Trebel Constr. Co., White Plains Ave. and 213th St., $43,745; cement walk in St. Catherine Park, to F. Mascali & Son, 645 East Tremont Ave., $1,305; repairing asphalt parks and parkways, to Brusstar Constr. Co., Harlem River and East 150th St., $2,725; demolishing buildings, Inwood Hill Park, to Parkside Building & Plumbing Supply Co., $3,460; repaving Hamilton Fish Park and asphalt walks in 2nd Ave., to Triboro Asphalt Co., $5,980 and $3,690 respectively; resurfacing playground St. Gabriel Park, to T. DiRoma, 33 Evelyn Pl., $1,655; wading pools in Chelsea Park and 59th St. playground, to Cavanaugh Contg. Co., $2,447 and $3,421 respectively; reconstructing Bronx and Pelham Parkway, to C. D. Beckwith, Inc., Seneca Ave. and Edgewater Rd., $1,920; reconstructing parapet wall in Pinehurst Ave., to M. J. Cauldwell, $1,437. Grand total $71,785. Noted Dec. 4.

Pa., Phila.—Bureau Hys., Dpt. P. Wks., A. Murdock, dir., City Hall Annex, to Trio Constr. Co., 6507 Haverford Ave., improving (grading, sewer assessment work) Olney Ave. from Philadelphia, Newton & New York R.R. to Rising Sun Ave. $20,233—to Union Paving Co., Broad and Stiles Sts., improving paving (assessment work) Olney Ave. from Front St. to Rising Sun Ave. $17,440; asphalt paving (assessment work) Briar St. from 75th Ave. to Washington Lane $5,092; High and Mechanic Sts. from Mansfield to Stenton Sts., $10,647; Juniper St. from Bigler to Pollock Sts. $3,323; Washington Lane from Mansfield to Stenton Sts. $9,834; asphalt re-paving Belgrade St. from Norris to York Sts. $4,718; Clearfield St. from Kensington to E Sts. $8,847—to Municipal Constr. Co., Washington Square Bldg., asphalt paving (assessment work) East Clapier St. from Baynton St. west to dead end $1,850; 4th and 5th Sts. from Market to Walnut Sts. $39,432—to V. Jafalla, Penna Bldg., furnishing, laying water pipe in Olney Ave. from Front St. to Rising Sun Ave. (assessment work) $8,504—to Eastern Asphalt Co., Penna Bldg., redressed granite block repaving Noble St. from Market to 3rd Sts. $6,249—to Lone Star Constr. Co., 225 South 15th St., furnishing, delivering high early strength portland cement $2,850—to W. Warner Co., 1616 Walnut St. binder stone $1,590—to G. F. Pellinos, 1206 Federal St., asphalt sand $2,160. Grand total $142,769. Noted Nov. 27.

Pa., Waynesburg—Moving, replacing 36,585 cu.yd. grading and fill East Green St., to Blueridge Constr. Co., P. O. Box 619, Uniontown, $18,888. Est. $25,000.

South Carolina—State Hy. Dpt., Columbia, to Carroll-Suber Contg. Co., Columbia, grading 18.7 mi. hy. Chesterfield Co., $42,132; topsoiling 7.4 mi. Newberry Co., $29,535; 4.3 mi. Lancaster and Chester Counties, $47,114—to Newell Contg. Co., Greenville, grading 11.5 mi. Chesterfield Co., $40,967—to Gibson Constr. Co., Walterboro, clay gravel surfacing 5.6 mi. Colleton Co., $63,165—to W. W. Tuck & Son, Greenwood, grading 21.1 mi. Spartanburg and Greenville Counties, $140,592. Grand total $363,505. Noted Nov. 27.

Tenn., Memphis—Bd. Comrs. Shelby Co., improving Hollyford Rd., to T. S. Neely, 669 Maury St., $33,170.

Tex., Austin — For 6 in. rein.-con. paving Chicon St. from 1st to 7th Sts., to L. E. Whitham & Co., 804 East 4th St., $30,584. Est. $30,000.

Tex., Bowie—Concrete paving 9,210 sq.yd., to General Constr. Co., Capps Bldg., Fort Worth, $21,337. Est. $25,000.

Tex., Dallas—Paving Akard St. from Jackson to Corinth Sts., to Thurber Constr. Co., Fort Worth Natl. Bank Bldg., $116,914.

Streets and Roads (Continued)

Tex., Fort Worth—For 2½ in. brick on 6 in. concrete paving Henderson St. underpass from Dagget to El Paso Sts., to H. K. McCollum, Fort Worth Natl. Bank Bldg., $31,857.

Tex., Fort Worth—City, c/o O. E. Carr, for 1:2:4½ monolithic mix and 1:6 monolithic mix paving East Front St., Jones to Oak Sts., to Tarrant Constr. Co., 1005 Calhoun St. $32,002 and $27,639 respectively. Est. $60,641.

Tex., Waco—Rein.-con. paving, storm sewers, 20,700 ft. Jefferson Ave., to J. E. Johnson Constr. Co., Waco, $48,074; storm sewers in same street, to Kelly & Isaacs, Waco, $2,861. Est. $50,000.

Washington—See "Bridges."

W. Va., Weirton—Hancock Co., brick on concrete paving 2.66 mi. Butler District Rd., 18 ft., to J. R. Rice, Belmont, O., $83,000. Est. $100,000.

Ont., Leaside — Town, asphalt on concrete paving 0.5 mi. Industrial St., to McNamara Constr. Co., 53 Yonge St., Toronto. Est. $30,000.

Ont., Sudbury—Dpt. Northern Development, Parliament Bldgs, Toronto, grading, 2½ in. bituminous retread surfacing 11.5 mi. Sudbury-Saulte Ste Marie Rd., to Bituminous Spraying & Contg. Co., Confederation Life Bldg., Toronto, $65,000.

Quebec — J. L. Boulanger, deputy minister roads, Parliament Bldgs., Quebec, gravel and macadam surfacing Provincial Hy. 5 between Sherbrooke and Montreal, to Laganiere & Houde Co., St. Charles De Grondines, $133,400.

EXCAVATION, DRAINAGE, IRRIGATION, LEVEES, RIVER AND HARBOR

PROPOSED WORK

Ariz., Buckeye—Roosevelt Irrigation Dist. preliminary plans concrete lining 18 mi. canals, $600,000 bonds voted. J. P. Van Denburg, Buckeye, dist. engr.

Conn., Milford — State Hy. Dpt., Hartford, bids in January, filling, grading Milford cut-off. J. Macdonald, State House, Hartford, engr. $250,000.

Ill., Quincy—Indian Grave Drainage Dist., F. Worley, pres., bids early in 1931, enlarging 25 mi. levee, southern half project, incl. 500,000 cu.yd. fill, northern half 12 mi. long. G. E. Edgerton, Rock Island, engr. Bushnell & Bushnell, Mercantile Bldg., Quincy, dist. engrs. $300,000.

La., New Orleans—Bd. Comrs. Port of New Orleans, Court Bldg., rejected bids Dec. 8, 900,000 hydraulic dredge fill on property Gulf, Mobile & Northern R.R. Co. west of Inner-Harbor Navigation Canal. Noted Dec. 4.

Tex., San Antonio—City, C. M. Chambers, mayor, improvements at Woodlawn Lake on west side of city, incl. dredging, deepening, cleaning body of water, constructing bathing beach, wider driveway around entire lake, recreational facilities, etc. $118,000. R. H. H. Hugman, Moore Bldg., archt.

BIDS ASKED

Ala., Birmingham—Jan. 23, by A. J. Hawkins, city engr., Sect. 3, Village Creek Drainage Project (from Avenue W, Ensley to 10th St. W.) adv. E. N.-R. Dec. 25.

Ind., Frankfort — Dec. 30, by Bd. Comrs. Clinton Co., Thos. W. Pierce Ditch, 51,542 cu.yd. excav. $27,000. J. B. Alford, Frankfort, engr.

Ind., Marion—Jan. 3, by Bd. Comrs. Grant Co., Hummel Ditch, 43,300 ft. long, $31,000. R. McGibbon, Marion, engr.

Ind., Warsaw — Jan. 3, by Bd. Comrs. Kosciusko Co., Shireman Ditch, 14,200 ft. long, $25,000. H. E. Smith, Warsaw, engr.

Pa., Phila. — Dec. 29, by Dpt. Wharves & Docks & Ferries, R. Weglein, dir., Pier 4, South Wharves, Contr. A, constructing Schuylkill River Bulkhead west side Mingo Creek; Contr. B, test piles between Gibson Point and Baltimore & Ohio R.R. Bridge, Schuylkill River; Contr. C, Schuylkill River Bulkhead east side Passyunk Ave.; Contr. D, sprinkler system Queen Street Pier 38 S.; Contr. E, emergency repairs to Floating Plant; Contr. F, repairing, reconditioning two 550 yard dump scows.

Que., Montreal — Jan. 5, by Terminal Architects and Engineers, University Tower, excavating and concrete work Montreal passenger terminal site, for Canadian Natl. Rys., C. B. Brown, ch. engr. (oper.).

CONTRACTS AWARDED

Mass., Boston — Dpt. P. Wks., dredging 10,000 cu.yd. at Calf Pasture Pumping Station, Dorchester, to Bay State Dredging & Contg. Co., 62 Condor St., East Boston, $4,900. Noted Dec. 4.

O., Cleveland—Cuyahoga Co., retaining wall on Wilson Mills Rd., to Ferwerda Bros., 15100 Tabor Ave., Maple Heights, $29,704. Est. $43,709. Noted Dec. 4.

Public Bond Elections

Coming Bond Elections

Waterworks — Waddington, N. Y., Dec. 30, $60,000.

Sewerage System—Waddington, N. Y., Dec. 30, $35,000.

Bonds Voted

Waterworks, Distribution System — Arlington, Kan., F. E. Devlin, Wichita, Engr., $32,500.

Waterworks—Monterey, Minn., $15,000. W. E. Buell & Co., Sioux City, Iowa, Engrs.

Sewerage System—San Marcos, Tex., $130,000.

Light Plant—Hominy, Okla., $150,000.

Bonds Defeated

Waterworks—Jackson, La., $20,000.

Waterworks—Washington, Okla., $17,500.

Waterworks—Oklahoma City, Okla., $1,000,000.

Sewers and Sewage Disposal—Oklahoma City, Okla., $1,400,000.

Incinerators—Oklahoma City, Okla., $240,000.

Viaducts—Oklahoma City, Okla., $1,275,000.

Street Widening — Oklahoma City, Okla., $410,000.

Fair Park Impvts. — Oklahoma City, Okla., $420,000.

Comfort Stations — Oklahoma City, Okla., $300,000.

Police Signal System—Oklahoma City, Okla., $50,000.

Convention Hall, City Hall, Hospital—Oklahoma City, Okla., $1,750,000.

Garage, Fire Stations and Equipment—Oklahoma City, Okla., $675,000.

FEDERAL GOVERNMENT

PROPOSED WORK

Calif., San Francisco—HEATING PLANT—Con. Q.M., Fort Mason, central heating plant at Fort McDowell, incl. three 100 hp. boilers, oil burners, underground distribution lines, pressure reducing valve, and changing all hot water heating plants to steam.

Calif., San Francisco—PUMP, etc.—Con. Q.M., Fort Mason, 2 stage turbine pump, additional valves at Fort Baker.

Ga., Waynesboro — POST OFFICE — Treas. Dpt. at office Sup. Archt., post office.

Idaho, Boise—HOSPITAL—Vet. Bu., Arlington Bldg., sketches hospital. W. H. Radcliff, c/o Vet. Bu., San Francisco, Calif., const. engr.

Ill., Savanna—MAIN—Con. Q. M. installing 4,500 lin.ft. 6 in. Class "C" c.i. main from heating plant and pumping plant to main entering Boston Station, at Ordnance Depot.

Louisiana—EARTHWORK—U. S. Eng., New Orleans, 76,000 cu.yd. earthwork in Red River and Bayou Des Glaiser Levee and Drainage Dist.

Me., Portland—POST OFFICE—Treas. Dpt. at office Sup. Archt. post office, Forest Ave.

Mass., Charlestown — STORAGE PLANT — Yards & Docks, Navy Dpt. steel storage plant, crane for marine railway at Navy Yard.

Mass., Springfield — POST OFFICE — Treas. Dpt. at office Sup. Archt., brick, steel, stone, Lyman, Dwight and Taylor Sts. Contract awarded for wrecking buildings to Bay State Wrecking Co., 73 Melha Ave.

Mich., Camp Custer—MESS BUILDINGS—Con. Q. M. 3 mess buildings for C.M.T.C.

Nev., Boulder City—SEWERS—U. S. Reclamation Serv., Denver, Colo., plans sanitary sewer system and disposal plant. Burton Lowther, Colorado Bldg., Denver, Colo., consult. engr.

N. H., Somersworth—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office.

N. Y., New York—POST OFFICE—Treas. Dpt. at office Sup. Archt., plans by McKim, Meade & White, 101 Park Ave., post office annex, 9th Ave., 31st and 33rd Sts. Noted Nov. 20.

Pa., Erie—POST OFFICE—Treas. Dpt. at office Sup. Archt., 1 story, basement, 206 x 280 ft., brick, stone, 13th and 14th Sts. Bids Dec. 29 for clearing site. Noted Sept. 4.

Pa., Kittanning—POST OFFICE—Treas. Dpt. at office Sup. Archt., 1 story, basement, 100 x 124 ft. post office, Arch and McKean Sts. Bids Dec. 29 for clearing site.

Pa., Pittsburgh—FEDERAL—Treas. Dpt. at office Sup. Archt., plans by Trowbridge & Livingstone, 527 5th Ave., New York, 10 story, 150 x 500 ft., 7th and Grant Sts. Wesikopf & Pickworth, 45 West 45th St., New York, structural engr. Noted Sept. 18.

Texas—DREDGING, etc.—U. S. Eng., Galveston, dredging, general maintenance work Galveston Channel; in Aransas Pass-Corpus Christi Channel; on Cypress Bayou and waterway between Jefferson, Tex. and Shreveport, La. and on intracoastal canal between Sabine River and Corpus Christi; dredging, wharf, dock, and deepening Freeport Harbor; deepening, dredging, extending Texas City Harbor.

Tex., El Paso—PRISON—Dpt. Justice, S. Bates, supt. Prisons, bids after Jan. 1, 3-4 story, basement, brick, steel federal prison. Noted Oct. 30.

Tex., Lubbock—POST OFFICE—Treas. Dpt. at office Sup. Archt., bids after Jan. 1, 3 story, basement, 87 x 102 ft. post office. Noted Sept. 4.

Tex., San Antonio — DEPOT SHOPS — Con. Q. M., bids about Jan. 15, air service mechanical repair shop, rein.-con., brick, at Duncan Field. Noted Oct. 9.

Tex., Waco—HOSPITAL—Vet. Bu., Arlington Bldg., bids in January, U. S. Veteran's Hospital. Noted Aug. 14.

BIDS ASKED

Ala., Anniston—HOSPITAL—Jan. 5, by Con. Q. M., 2 story, basement, 84 x 102 ft. hospital, at Fort McClellan.

Ala., Montgomery — PAINT WAREHOUSE, etc.—Jan. 16, at office Con. Q. M., paint, oil and dope warehouse, maintenance shop, warehouse and garage at Maxwell Field; adv. E. N.-R. Dec. 25.

D. C., Wash.—AIR COMPRESSOR—Jan. 2, by A. L. Flint, genl. purch. agt. Panama Canal, air compressor, split pine sleeves, drill sharpener, shank and bit punch, oil furnace, telegraph transmitters, portable pumps, etc., Schedule 2617.

D. C., Wash.—DOORS, etc.—Jan. 12, by A. L. Flint, general purch. officer Panama Canal, hollow metal doors, iron gates, grille gates, grilles, grille guards, screen stops and hardware for Corozal Hospital Ward, Schedule 2616.

Fla., Lake Okeechobee—CORE DRILLING—Dec. 29, by U. S. Eng. Jacksonville, in Lake Okeechobee; adv. E. N.-R. Dec. 25.

Ind., Brazil — POST OFFICE — Dec. 30, by Treas. Dpt. at office Sup. Archt., altering U. S. Post Office, Main St.

Ind., Decatur—POST OFFICE—Jan. 7, by Treas. Dpt. at office Sup. Archt., U. S. Post Office, 122 East Monroe St. Noted Nov. 13.

Louisiana — EARTHWORK — See "Contracts Awarded."

Nev., Las Vegas — DAM — Mar. 4, at office Bureau Reclamation, Wilda Bldg., 1441 Welton St., Denver, Colo., Hoover Dam, power plant, appurtenant works, Boulder Canyon Project, Arizona-Nevada-California, on Colorado River, Black Canyon Dam site, 30 mi. southeast of here; adv. E. N.-R. Dec. 25. Noted Nov. 20.

N. Y., New York—REMODELING—Jan. 12, by Treas. Dpt. at office Sup. Archt., remodeling (except elevators), U. S. Old Appraisers Stores (U. S. Govt. Warehouse).

Tex., Randolph Field—QUARTERS—Jan. 15, at office Con. Q. M., seventeen 2 story company officers quarters; adv. E. N.-R. Dec. 25. Noted Oct. 23.

Va., Langley Field—PAINT, OIL and DOPE HOUSE, etc.—Jan. 20, at office Con. Q. M., Fort Monroe, 1 paint, oil and dope house, 1 parachute building at Langley Field; adv. E. N.-R. Dec. 25.

Wis., Milwaukee—TUGS—Jan. 16, by U. S. Eng., 4 steel, diesel-driven tugs; adv. E. N.-R. Dec. 25.

CONTRACTS AWARDED

Ala., Montgomery—QUARTERS—Con. Q. M., Maxwell Field, 9 double sets non-commissioned officers quarters, Maxwell Field, to Batson Cook Co., West Point, Ga., $121,700. Noted Nov. 27.

Ark., Hot Springs — RESERVOIRS — Dpt. Interior, Field Headquarters, Natl. Park Serv., 409 Underwood Bldg., San Francisco, Calif., 2 underground storage reservoirs, pumping system, at Hot Springs Natl. Park, to Wickes Eng. & Constr. Co., 1441 Bluff St., Des Moines, Ia., $40,098. Noted Oct. 30.

Louisiana — EARTHWORK — U. S. Eng., Vicksburg, Miss., will construct 1,329,000 cu.yd. earthwork in Duckport New Levee on west bank Mississippi River, own forces. Former bids rejected. Noted Nov. 20.

Me., Portland—COURT HOUSE—Treas. Dpt. at office Sup. Archt., excavation for court house extension, to R. Kennedy & Co., Inc., 465 Congress St., Portland, $1,380. Noted Dec. 4.

Md., Annapolis—SEA WALL—Yards & Docks, Navy Dpt., sea wall at U. S. Naval Academy, to Hercules Constr. Co., 21 East 40th St., New York, $19,417.

Mo., Dover — DIKES — U. S. Eng., Postal Telegraph Bldg., Kansas City, 6,800 lin.ft. pile clump dikes and 4,800 ft. revetment in Missouri River at Sheep Nose Bend, 4.7 mi. from here, to Massman Constr. Co., Amer. Bank Bldg., Kansas City, $237,500. Noted Nov. 13.

N. M., Carlsbad—ELEVATOR SHAFT—Dpt. Interior, Field Headquarters, Natl. Park Serv., Underwood Bldg., San Francisco, Calif., elevator shaft at Carlsbad Caverns Natl. Park, to C. H. Dunning, Phoenix, Ariz., $59,225. Noted Oct. 30.

S. C., Spartanburg—ELEVATOR—Treas. Dpt. at office Sup. Archt. elevators for U. S. Post Office, to Haughton Elevator & Machine Co., 1103 Vermont Ave., Wash., D. C., $9,580. Noted Dec. 11.

Va., Quantico — DREDGING — Spec. 6182 — Yards & Docks, Navy Dpt., filling, grading at U. S. Marine Barracks, Item 3, to Standard Dredging Co., 233 Bway., New York, $147,290. Noted Nov. 6.

RAILWAYS

PROPOSED WORK

New York—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, bids in spring 5 mi. line between Briarcliffe Manor and Eastview, $1,192,000. Noted Jan. 2.

BIDS ASKED

Washington—See "Contracts Awarded."

CONTRACTS AWARDED

Washington — Bd. P. Wks., Seattle, single track municipal street railway extension on Beacon Ave., in Seattle, day labor, $56,000. Noted Dec. 4.

British Columbia—Canadian Pacific Ry., J. M. R. Fairbairn, ch. engr. system, Montreal, Que., clearing, grading, culverts, trestles on Kettle Valley Ry., near Penticton, to W. C. Arnett, 927 Vancouver Blk., Vancouver, $260,000. Noted Dec. 4.

Constr. News page 259

SUBWAYS AND TUNNELS

PROPOSED WORK

Calif., Los Angeles—City Harbor Dpt., 638 Beacon and San Pedro Sts., surveys 5,375 ft. concrete, steel vehicular tunnel, with 2-way 25 ft. driveway, 45 ft. below mean low water connecting Terminal Island with mainland near Wilmington. $6,250,000.

Virginia—See "Bridges."

CONTRACTS AWARDED

B. C., Vancouver — Canadian Pacific Ry., J. M. R. Fairbairn, ch .engr., Montreal, Que., 4,609 ft. tunnel 16-19 ft. wide, concrete lined from Thurlow St., False Creek Yards under Dunsmuir St., to Northern Constr. Co. Ltd. & J. W. Stewart, 736 Granville St., $1,535,900. Noted Oct. 30.

GRADE CROSSINGS

PROPOSED WORK

Calif., Los Angeles — Los Angeles Co. and Union Pacific R.R. Co., 1416 Dodge St., Omaha, Neb., H. C. Mann, ch. engr., grade separation over tracks at Firestone Blvd. Los Angeles Co. share of cost is $40,000. W. B. Armstrong, Hall of Records, co. bridge engr. Railway is now constructing its portion of project.

N. J., Palmyra—State Hy. Comn., Trenton, and Pennsylvania R.R. Co., T. J. Skillman, ch. engr., Phila., Pa., bridge over tracks to eliminate grade crossing. $162,949.

New York—Delaware & Hudson R.R. Co., J. MacMartin, ch. engr., Albany, relocating railroad tracks in connection with Mill Rd., Fort Hunter Rd. and Campbell Ave. Grade Crossings in Schenectady and Rotterdam. $224,676.

N. Y., Avon—Erie R.R. Co., G. S. Fanning, ch. engr., 50 Church St., New York, replacing Five-Arch Bridge with structure to carry Rochester branch Erie R.R. over Geneseo-Avon Co. Hy., Livingston Co. $84,000.

N. Y., Frankfort—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, eliminating grade crossing on West Schuyler-Dike Rd., 3.4 mi. east of Utica Sta., Herkimer Co. $104,000.

N. Y., Hastings—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, eliminating Plank Rd. Crossing on Syracuse-Watertown Co. Hy. south on Central Square. $155,200.

N. Y., Lancaster — Erie R.R. Co., G. S. Fanning, ch. engr., 50 Church St., New York, eliminating Cemetery Rd. Crossing. $120,317.

N. Y., Mexico—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, eliminating Colosse Crossing, 2 mi. south Maple View Station. $139,100.

BIDS ASKED

Mo., St. Louis—Illinois Terminal R.R. Co., E. S. Hight, ch. engr., 231 South La Salle St., Chicago, Ill., bids about Feb. 1, erecting subway steel, under 12th St. between point south of Cass and Lucas Aves. Fabricating 6,000 tons structural steel, to McClintic-Marshall Co., 1416 1st Natl. Bank Bldg., Chicago, Ill.

CONTRACTS AWARDED

N. Y., Kitchawan — New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, grade crossing elimination, to Bates & Rogers, 75 West St., New York.

N. Y., Utica—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, eliminating grade crossing, to Walsh Constr. Co., Herald Bldg., Syracuse.

PIERS AND WHARVES

PROPOSED WORK

Mass., Tisbury—WHARF—Dukes Co. Garage Co., W. Manter, Vineyard Haven, wharf Vineyard Haven Dist., incl. planking, filling, dredging, wood piles. $25,000. Private plans.

N. J., Bayonne—PIERS—Bd. City Comrs., W. A. Conway, chn. Planning Com., City Hall. 3 piers on New York Bay Waterfront. $25,000 or more. Engineer not selected.

BIDS ASKED

Que., Mont Louis—WHARF—Dec. 30, by N. Desjardins, secy. Dpt. P. Wks., Ottawa, Ont. extending wharf.

CONTRACTS AWARDED

Mass., Fall River—WHARF—Shell Eastern Petroleum Products, 141 Milk St., Boston, and Channing Bldg., New York, 22 x 400 ft. piling and planking wharf, Taunton River, to Phoenix Constr. Co., 41 Park Row, New York.

AIRPORTS

PROPOSED WORK

Ark., Little Rock—City Airport Comn., c/o P. L. Robinson, mayor, improvements on 80 acre site adjoining present airfield, incl. hangars hangars, shops, filling stations. $200,000, incl. site. E. E. Stansberry, City Hall, engr.

Mass., Norwood, etc.—Massachusetts Airport Terminal & Arena, H. E. Shaw, Norwood, soon takes bids 1 hangar, 3 runways at proposed airport, Fisher Meadows of Neponset St., Norwood, Dedham and Canton. Total est. 1,000,-

Constr. News page 260

000. C. Kenniston, 14 Meadow St., Norwood, drainage engr.

BIDS ASKED

N. Y., Buffalo—Dec. 31, by G. Fisk, comr. P. Wks., airport, incl. general contract, electrical work, heating, plumbing, drainage, gas fittings, hangar doors, excavating, concrete loading platform, concrete retaining wall, concrete ramp, 15 and 20 in. vitr. sewer, at Marine Airport, foot Georgia St. Former bids rejected. W. Rathman, city engr. Noted Aug. 28.

GRAIN ELEVATORS

CONTRACTS AWARDED

N. Y., Oswego—GRAIN ELEVATOR—Oswego Harbor & Dock Comn., 2,000,000 bu. elevator, to Fegles Eng. Co., 523 South 7th St., Minneapolis, Minn. Est. $1,800,000. Noted June 19.

POWER AND LIGHTING

PROPOSED WORK

Calif., Pasadena—City electrolier system and underground works (pressed steel standards) in Colorado St. between Bway. and Lake Ave. $64,550. G. K. Hooper, city engr.

Texas — Central Power & Light Co., San Benito, transmission line between Edinburg and Falfurrias. $150,000.

BIDS ASKED

N. Y., Poughkeepsie—Dec. 30, by Dpt. P. Wks., State Office Bldg., Albany, ornamental lighting fixtures and sign on administration building on Mid-Hudson Bridge.

CONTRACTS AWARDED

Ind., Auburn—City Council, rebuilding power and lighting system, to R. Deel, 1206 North Anthony Bldg., Ft. Wayne, $23,536. Est. $31,000.

SPORTS AND PARKS

PROPOSED WORK

Conn., New Haven—City, Park Dpt., City Hall, rejected bids 1st unit, rein.-con., brick, bathhouse at Lighthouse Point. To exceed $25,000. R. W. Foote, 185 Church St., engr. Noted Dec. 11.

Ill., Lincoln—Lincoln Sand & Gravel Co., J. Johnson, pres., improving 400 acres for bathing beach, roads, diving tower, landscaping, bridge, etc. $50,000. L. E. Robinson, Jefferson Bldg., Peoria, archt.

Mass., Boston—City, Park Dpt., 33 Beacon St., constructing addition to Fallon Playground, Roslindale, $65,000. J. J. Murphy, Park Dpt., engr.

Mass., Brookline—Town, Park Dpt., sketches by Kilham, Hopkins & Greeley, 9 Park St., Boston, golf course and clubhouse, Putterham Playground. $243,450 appropriated. Noted Oct. 9.

Mass., Framingham—Town, A. C. Winch, chn. Bd. P. Wks., grandstand and field house, athletic field, Union Ave. $25,000 or more. Engineer not selected.

Mass., Salem—City, Park Dpt., City Hall, municipal golf course, Cabot Farm property. $25,000. Stiles & Van Kleek, 97 Newbury St., Boston, engrs. Noted Dec. 11.

Mass., Wakefield — Town, Bd. Selectmen, bath house at Lake Quannopowitt. $25,000.

N. J., Rutherford—Bd. Educ., High School, open air amphitheatre in rear Lincoln School, Montross Ave. $25,000.

N. J., Trenton — International Automobile Speedway, Inc., A. E. DeMayo, engr., c/o Yara Eng. Co., 50 Broad St., New York, bids in January, general contract 3 mi. bowl for motor speedway, near Clarksville. $2,000,000. Noted Oct. 16.

BIDS ASKED

Mass., Hyde Park—See "Contracts Awarded."

N. J., North Long Branch — H. I. Braun, archt., 191 Bway., Long Branch, bids about Feb. 1, general contract 1 story, basement, brick, steel bathing pavilion, incl. 350 bath houses, 150 lockers, reception, shower and laundry room, Ocean Ave., for S. A. McNair, 388 Ocean Ave. $150,000. Noted Dec. 4.

CONTRACTS AWARDED

Calif., Los Angeles—Pilgrimage Play Assn., c/o W. L. Woollett, Architects Bldg., rein.-con. amphitheatre, 1,650 seating capacity, Cahuenga and Highland Aves., to W. Simpson Constr. Co., Architects Bldg., $250,000.

Ia., Davenport — Davenport Levee Impvt. Com., c/o W. Priester, secy., general contract concrete stadium building and athletic field, to Tunnicliffe Constr. Co., Putnam Bldg., $96,000; concrete piles, to Raymond Concrete Pile Co., 111 West Monroe St., Chicago, Ill., $10,500; heating and plumbing, to Ryan Plumbing & Heating Co., 403 Brady St., $9,000. Grand total $115,500. Est. $120,000. Noted Dec. 11.

Mass., Hyannis — Hyannisport Club, L. F. Paine, pres. Masonic Bldg., golf course addition, Scudder Ave., to L. A. Byrne, West Dennis. Est. $25,000. Noted Nov. 13.

Mass., Hyde Park — City, Park Dpt., 33 Beacon St., clearing site of municipal golf course, Grew Estate, day labor. $25,000 or more. Noted Dec. 11.

Mass., Wellesley—Owner, golf course, Forest St., to S. DiPuccio, Sachem Rd., Needham. Est. $25,000-$30,000.

N. J., Spring Lake—Mayor and City Council, pavilion, to W. Bowker, Spring Lake, $102,578; electrical work, to M. M. Krater, Freehold, $3,658; plumbing, to Campion Dangler, Spring Lake, $12,420. Grand total $118,656.

HEATING AND VENTILATING

PROPOSED WORK

N. Y., New York—St. Vincent's Hospital, 7th Ave. and 11th Sts., installing below surface 2 steel fuel oil tanks and complete oil burning equipment. To exceed $25,000. J. W. O'Connor, 162 East 37th St., archt.

CONTRACTS AWARDED

Mass., Framingham—New England Telephone & Telegraph Co., 50 Oliver St., Boston, heating in exchange building, Lexington Ave. and Union St., to V. J. Kenneally Co., 10 West 5th St., South Boston; plumbing, to P. W. Donoghue Co., 170 Purchase St., Boston; electrical work, to M. C. Brown, Concord St., Framingham. Est. $25,000.

Mass., Springfield—Springfield Hospital, 759 Chestnut St., heating and ventilating in hospital addition and service building, North Chestnut and Springfield Sts., to F. C. McClean, 47 Park St., est. exceeds $25,000; electrical work, to Interstate Electric Constr. Co., 26 Taylor St., $25,000 or more; plumbing, to A. E. Mayer, 419 Main St., est. exceeds $25,000. Noted Nov. 20, under "Hospitals."

UNCLASSIFIED

PROPOSED WORK

Minn., Minneapolis—ELEVATORS—Municipal Building Comn., C. A. Bloomquist, city treas., 2 passenger elevators in city hall and court house building. $32,500. N. W. Elsberg, city engr.

N. J., New Brunswick—RADIO STATION—R. C. A. Corp., M. Shannon, in charge, 166 Broad St., New York, brick, steel, Easton Ave. $2,000,000. Project in abeyance. C. Mackenzie, 119 Broad St., New York, archt. Noted Oct. 23.

N. Y., Rochester—TELEPHONE IMPROVEMENTS—Rochester Telephone Co., 59 State St., plans extending and improving service. To expend $2,500,000 during 1931 and $12,000,000 in next five years. J. P. Boylan, pres. and genl. mgr.

Texas—GAS DISTRIBUTION—A. E. Young, S. G. and L. Harrison, Brookshire, granted franchises for natural gas distribution, incl. mains, laterals, etc. in Brookshire and Pattison. $60,000. Private plans.

Texas—GAS PIPE LINE—Rio Grande Valley Gas Co., Weslaco, 8 in. c.i. welded gas line between Weslaco and Raymondville. Soehle & Epton, Weslaco, engrs.

Texas and **Louisiana**—NATURAL GAS PIPE LINE—United Pipe Line Corp., Kirbyville and Houston, subsidiary of United Gas System, soon lets contract 158 mi. 6- to 14-in. c.i. welded natural gas pipe line between Kirbyville, Tex. and Franklin, La., $300,000; also 265½ mi. 2- to 6-in. c.i. welded lateral natural gas lines between same points. $700,000. Private plans.

Tex., Tahoka — POTASH and SILICA DEPOSIT DEVELOPMENT—Del Stephens & Associates, Milam Bldg., San Antonio, developing potash and silica deposits, incl. piping potash brine from lake 8 mi. west of here into town where treatment factory will be erected. Private plans.

Utah — GAS MAINS — Utah Valley Gas & Coke Co., Provo, subsidiary C. Loomis Allen Interests, 149 Bway., New York, bids in spring or later, 22 mi. gas pipe line, enlarging existing mains from Provo to Lehi. $600,000. Noted June 27.

BIDS ASKED

N. J., Wayne — TOWERS, etc. — Columbia Broadcasting System, Inc., S. Packard, vice pres., 485 Madison Ave., New York, taking bids towers, antennae, building and transmitters for radio broadcasting station. $40,000. Blaw-Knox Co., 342 Madison Ave., New York, engrs. and archts. Noted Oct. 16.

N. Y., Attica—REFRIGERATION—Jan. 13, by Commissioner Dpt. Correction, State Office Bldg., Albany, refrigeration work for dining, kitchen and bakery building, Attica State Prison; adv. E. N.-R. Dec. 25.

N. Y., Creedmoor — ELECTRIC SERVICE CONNECTIONS—Jan. 14, by Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, electric service connections, addition power plant equipment for Creedmoor Div., Brooklyn State Hospital.

Tex., Beaumont—JAIL EQUIPMENT—Jan. 19 (extended date), by Jefferson Co., c/o B. B. Johnson, judge, furnishing all furnishings, equipment for jail and insane ward work for court house. F. C. Stone, Goodhue Bldg., archt. Noted Nov. 27.

CONTRACTS AWARDED

Illinois — TELEPHONE IMPROVEMENTS — American Telegraph & Telephone Co., 829 Telephone Bldg., St. Louis, Mo., 2 repeater stations, one 59 x 90 ft. at Jewett, other 52 x 83 ft. at Vandalia, both 1 story, basement, rein.-con., brick, to C. F. Reinhart, Telephone Bldg., St. Louis, Mo. Noted Dec. 11.

Mass., Lawrence—LOADING PLATFORM, etc. —Boston & Maine R.R. Co., W. J. Backes, Boston, ch. engr., Boston, steel, timber, loading platform and canopy, to H. Wales-Lines Co., 134 State St., Meriden, Conn. Est. exceeds $25,000.

Unclassified (Continued)

Mich., Plymouth—PRISON CELLS—Detroit House of Correction, 141 Alfred St., Detroit, 100 cells at Detroit House of Correction prison farm, to Southern Prison Co., 4500 South Presa St., San Antonio, Tex., $49,600. Noted Oct. 23 under "Public."

N. J., Jersey City—COAL POCKET, etc.—Hudson County Coal Corp., 611 Tonnele Ave., general contract 2 story coal pocket and rescreening bins, Tonnelle Ave.; to Guarantee Constr. Co., 17 Battery Pl., New York. Est. $40,000.

N. Y., Brooklyn—ELEVATOR SHAFTS—Brooklyn Hospital, De Kalb Ave. and Ashland Pl. altering elevator shafts and elevators in 8 and 9 story buildings to Otis Elevator Co., 310 Clinton St., $80,480.

N. Y., Creedmoor—TUNNELS—Commissioner Dpt. Mental Hygiene, State Office Bldg., tunnels (service connections) at Brooklyn State Hospital, to Williams Bridge Building Co., 2 Lafayette St., New York, $77,500; heating, to H. Sand & Co., 158 Greene St., New York, $208,500. Noted Nov. 20.

N. Y., Ithaca—ELEVATOR—Commissioner Dpt. Educ., State Education Bldg., Albany, electric elevators at Plant Industry Building, New York State College of Agriculture, to Graves Elevator Co., 347 Blossom Rd., Rochester, $20,540. Noted Oct. 30.

N. Y., Ithaca—REFRIGERATION—Commissioner Education, State Educ. Bldg., Albany, refrigeration work at Plant Industry Building, New York State College Agriculture, Cornell University, to Frick Co., Inc., Waynesboro, Pa., $42,000. Noted Oct. 16.

N. Y., New York—MACHINERY and CONTROL EQUIPMENT—A. Goldman, comr. Plant & Structures, Municipal Bldg., New York, furnishing, erecting machinery and control equipment for Ship Canal Bridge over Harlem River near 225th St., to Steele & Condict Div. of McKiernan Terry Corp., 15 Park Row, $22,450. Noted Dec. 4.

N. Y., Pine Aire Station—TUNNELS, etc.—Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, general contract service tunnels at Pilgrim State Hospital, to Brady Concrete Constr. Co., 25 West 45th St., New York, $92,436; heating, to R. H. Baker, 101 Park Ave., New York, $388,900; electrical work, to W. H. Taverner Corp., 51 East 57th St., New York, $154,200. Grand total $635,536. Noted Oct. 30.

Oklahoma—OIL PIPE LINE—Continental Oil Co., Ponca City, E. H. Skinner, mgr., 86 mi. 10 in. oil pipe line from Oklahoma City oil fields to refinery at Ponca City, to Truman & Smith, Mid-Continent Bldg., Tulsa, $775,000. Est. $900,000.

MATERIALS

BIDS ASKED

PIG LEAD—**Baltimore, Md.**—Dec. 31, by Bd. Awards, 200,000 lb. pig lead. E. G. Rost, Municipal Bldg., water engr.

DOUGLAS FIR, etc.—**Boston, Mass.**—Dec. 29, by Transit Dpt., 1 Beacon St., Douglas fir or spruce and long leaf yellow pine as specified, $5,000. T. F. Sullivan, chn.

SPECIAL CASTINGS, etc.—**Boston, Mass.**—Dec. 26, by Supply Dpt., P. A. Chapman, supt., 100,000 lb. special castings; 200,000 lb. frames and covers, iron castings; 200,000 lb. service pipe stock; 350,000 lb. gate and hydrant castings; 400,000 lb. branches, curves to Water Service.

CABLE—**Newark, N. J.**—Dec. 29, by Bd. P. Safety, City Hall, 25,000 ft. rubber insulated lead covered cable. $5,000. J. B. Keenan, city engr.

FUEL OIL, etc.—**Brooklyn, N. Y.**—Dec. 29, by H. Hesterberg, pres. Brooklyn Boro, Boro Hall, 600,000 gal. fuel oil; 400,000 gal. fuel oil; 40,000 gal. Navy standard fuel oil; 20,000 gal. furnace oil; 15,000 gal. kerosene oil; 5,000 bbl. portland cement; 5,000 cu.yd. steam cinders; 600,000 gal. sheet asphalt and bituminous concrete mixtures "B" in liquid form; 4,000 net tons limestone or other inorganic dust; 15,000 cu.yd. asphalt sand; 10,000 cu.yd. binder stone; 6,000 cu.yd. sand for concrete and paving.

OAK PILING—**Cleveland, O.**—Dec. 27, by Bd. Comrs. Cuyahoga Co., 18,000 ft. oak piling for Pier 9, of New Lorain-Central Bridge. $27,000. F. Williams, Court House, engr.

CONTRACTS AWARDED

PIPE—**Glendale, Calif.**—City, to Natl. Cast Iron Pipe Co., 417 South Hill St., Los Angeles, 204 ft. 30 in. Class D c.i. pipe at $9.78 per ft., 2,200 ft. Class B. 30 in. $7.24, 500 ft. 24 in. $5.07, 600 ft. 20 in. Class D $4.98.

METAL FRAMES, etc.—**Baltimore, Md.**—Bd. Awards, delivering metal frames and covers to Bureau of Water Supply, to J. J. Lacey Co., 1401 Block St., $4,452.

EQUIPMENT

BIDS ASKED

TRUCKS—**Indianapolis, Ind.**—Jan. 6, by Bd. Comrs. Sanitary Dist. of Indianapolis, 7.5 ton tractor truck and one 3 to 4-ton tractor trucks for collection and removal garbage and ashes. B. J. T. Jeup, pres.

TRACTORS, etc.—**Colfax, La.**—Jan. 5, by Police Jury Grant Parish, J. G. Pope, pres., crawler tractor No. 20, leaning wheel grader No. 7 for Ward 6, also crawler tractor for Ward 4.

GASOLINE SHOVEL—**Reno, Nev.**—Jan. 16, by Comrs. Washoe Co., E. H. Beemer, clk., one ¾ yd. full swing gasoline shovel.

STEEL LOCKERS, etc.—**Cleveland Heights** (br. Cleveland), **O.**—Jan. 5, by Bd. Educ., W. G. Nesbit, dir., 1749 Lee Rd., steel lockers, laboratory, class room and office equipment for high school addition. J. H. Graham Co., 1612 Euclid Ave., Cleveland, archt.

MAINTAINERS, etc.—**Houston, Tex.**—Dec. 29, by Harris Co., c/o H. L. Washburn, aud., 3 maintainers and two 2½ ton trucks.

TRUCKS, etc.—**Houston, Tex.**—Jan. 12, by Harris Co., c/o H. L. Washburn, aud., 7 trucks, 1 tractor and 7 cars untreated lumber for Precinct 3; 2 trucks, 1 grader, 3 tractors for Precinct 4. C. R. Haile, Houston, co. engr.

FIRE EQUIPMENT—**Victoria, B. C.**—Jan. 6, by City Council, City Hall, 2 pumpers, chassis for fire ladder and 5 nets. $40,000. E. F. Mitchell, City Hall, purch. agt.

CONTRACTS AWARDED

CRANES—**Detroit, Mich.**—Bd. Water Comrs., furnishing, installing 3 electric travel cranes in power plant of Springwells Station, to Northern Eng. Wks., 210 Chene St., $19,180. Noted Nov. 6.

FOREIGN

Argentina, Buenos Aires—Firestone de La Argentina, subsidiary Firestone Tire & Rubber Co., South Main St., Akron, O., tire manufacturing plant and power house, to Dwight P. Robinson & Co. of Argentina, Inc., div. of United Engineers & Constructors, Inc., 112 North Broad St., Phila., Pa. Noted Nov. 13.

Chile—Owner, c/o Government, Santiago, soon takes bids Trans-Andean railroad from Antofogasta, Chile, to Salta Argentina. $12,000,000. Noted Jan. 2.

England, London—Selfridge & Co., London, plans department store. To exceed $5,000,000.

Germany, Kaiseraugst—Ford Motor Co., 3674 Schaefer Rd., Dearborn, Mich., plans motor assembly plant here, vicinity Basel. **Maturity in spring.**

Jugoslavia—Ford Motor Co., 3674 Schaefer Rd., Dearborn, Mich., plans automobile assembly plant. To exceed $200,000. **Maturity indefinite.**

Mexico, Mexico City—DeLalama & Basurto, Mexico City, hotel, to Fisher-Drake Co., 360 North Michigan Ave., Chicago, Ill. Est. $4,000,000.

Mexico, Reynosa—City, waterworks plant, incl. pumping and filtration plants, 24,000 lin.ft. 8 in. mains, 2 buildings for housing machinery and equipment, mostly by day labor. $100,000. Private plans.

U.S.S.R., Moscow—Soviet Government, c/o Amtorg Trading Corp., 261 5th Ave., New York, will build gas manufacturing plant and pipe lines, day labor and separate contracts. To exceed $5,000,000. Lucas & Luick, 231 South La Salle St., Chicago, Ill., engrs.

Buildings

RESIDENTIAL

BIDS ASKED

N. J., Hoboken—Marlboro Co., Inc., M. J. O'Leary, 730 Hudson St., taking bids on separate contracts 5 story, basement, brick, steel, 1013-19 Washington St. $150,000. C. I. Goldberg, 921 Bergen Ave., Jersey City, archt.

N. J., Newark — Owner, c/o H. F. Clark, archt., 39 Central Ave., taking bids general contract 5 story, basement brick steel, 2-6 Renner Ave. $150,000.

N. Y., New York—Schwartz & Gross, archts., 347 5th Ave., taking bids on separate contracts 13 story, 240 Greene St., for Fourteen Washington Place Corp., L. Jakobson, pres., 261 Bway. $500,000.

Ont., Ottawa — Godson Constr. Co., 404 Laurier Ave. E., bids early in 1931, brick, plain found., Stanley Ave. $350,000.

CONTRACTS AWARDED

Calif., Blythe—Blythe-Monterey Syndicate, 2 story, cement block hotel, on 600 x 1,300 ft. site, to F. L. Foley, 622½ La Brea Rd., Los Angeles, $150,000.

Calif., San Francisco—W. Helbing, Sr., 1310 Lombard St., 7 story, basement, rein.-con., Bway. near Webster Sts., to Helbing Co., 1310 Lombard St., $175,000.

CLUBS

PROPOSED WORK

Calif., San Francisco—San Francisco Shriners, Islam Temple, sketches Shrine Temple, Class A, steel, rein.-con. $2,000,000. Architect not selected.

Ill., Chicago—Northern Athletic Club, 2310 Lawrence Ave., soon takes bids 13 story, rein.-con., brick, Oakley and Lawrence Aves. $1,200,000. W. G. Uffendell, 39 South State St., archt. Noted Nov. 27.

Ill., Kewanee—Y. M. C. A., 102 South Main St., W. E. Lauterbach, secy., soon takes bids 2 story, basement, brick, limestone, 1st St. $200,000. C. Walcott, 435 North Michigan Ave., Chicago, archt. J. W. Ogg, Y. M. C. A. Central Bureau, Chicago, assoc. archt.

BIDS ASKED

Conn., Bridgeport — Jan. 5, by Algonquin Club., 211 State St., brick, steel, marble Harrison and Golden Hill Sts. $200,000. F. J. Dixon, 340 State St., archt. Fletcher-Thompson, Inc., 1336 Fairfield Ave., engrs. Noted Dec. 11.

CONTRACTS AWARDED

N. Y., Rochester — Jewish Young Men's & Women's Assn., general contract 7 story, basement, club, Franklin Sq., to A. Friederich & Sons Co., 710 Lake Ave.; plumbing and heating, to Bareham & McFarland, 366 Main St., E.; electrical work, to Dwyer Electrical Co., 2113 Monroe Ave. Est. $1,000,000.

Okla., Oklahoma City—Hawk & Parr, archts., Cotton Exch. Bldg., 10 story, basement, 120 x 125 ft., rein.-con., caisson found., to J. H. Frederickson, Baltimore Bldg., for Y. W. C. A. $360,090. Noted Nov. 6.

HOSPITALS

PROPOSED WORK

Calif., Los Angeles—City plans by C. O. Brittain, city constr. supt., City Hall, 3 story, 125 x 125 ft., probably rein.-con. health center, incl. clinics, offices. $1,000,000.

Ill., Bloomington—Professional Men's Assn., Griesheim Bldg., W. W. Gailey, E. P. Sloan and F. Deneen, members building comm., sketches 8 or 10 story, 72 x 108 ft. medical, dental office and clinic building, Main St. $500,000. Architect not selected.

Mass., Boston — City, Hospital Dpt., J. J. Dowling, supt., 818 Harrison Ave., relief station (hospital), Dorchester Sect. To exceed $150,000. Architect not selected.

N. Y., New York — Memorial Hospital, 2 West 106th St., sketches experimental laboratory for X-Ray. $150,000. Y. M. Karekin, 136 Liberty St., consult. engr.

N. Y., Utica—Utica Memorial Hospital soon takes bids 4 story addition. Kinne & Frank, 7 Hopper St., archts.

Tex., Galveston—State Medical College plans by H. Giesecke, c/o A. & M. College, Bryan, and associates and takes competitive bids in January, 2 and 3 story, basement, rein.-con., brick, stone, rein.-con. laboratory, plain found. $400,000.

BIDS ASKED

Ill., Pekin — Pekin Public Hospital Assn., 14th St., A. Hyde, secy., taking bids 2 story, basement, 41 x 140 ft., rein.-con., brick, 14th St. $150,000. F. Klein, Steinmetz Bldg., archt.

N. Y., Central Islip—Feb. 4, by Dpt. Mental Hygiene, State Office Bldg., Albany, altering dining room and kitchen building, service connections and power house equipment, at Central Islip State Hospital. To exceed $150,000.

N. Y., Oxford—Jan. 29, by Dpt. Standards, State Office Bldg., Albany, hospital at New York State Women's Relief Corps, Home. To exceed $150,000.

N. Y., Staten Island—Dec. 30, by J. G. W. Greeff, comr. Hospitals, Municipal Bldg., New York, general contract 4 groups steel, timber, dormitory buildings with connecting corridors, concrete transformer building, for Home for Dependents, Richmond Branch.

CONTRACTS AWARDED

Mich., Ann Arbor—University of Michigan, 2 story, rein.-con., steel, brick, top addition to hospital, to Otto Misch Co., 159 East Columbia St., Detroit, $175,463. Noted Nov. 6.

Mo., St. Louis — St. Louis University, R. Johnston, pres., 221 South Grand St., foundation and footings contract for Firmin Desloge Hospital, 14 story, 200 x 250 ft., to McCormack-Coombs Constr. Co., Columbia Bldg. Total est. $1,000,000. Noted Nov. 6.

CHURCHES

PROPOSED WORK

N. J., East Orange—Sanford Street Episcopal Church, Central Ave., 2 story, basement, brick, steel office, stores, Central Ave. and Sanford St. $150,000. **Maturity probably soon.** H. Silverston & H. Gordon, c/o Hartmann & Sanford, Inc., 60 Park Pl., Newark, lessee.

N. J., Red Bank—Lutheran Church, P. J. Prischler, pastor, 2 story, basement, brick, steel, River Rd. between Throckmorton Ave. and Spring St. $150,000. Architect not selected.

Pa., Altoona—Grace Lutheran Church, B. A. Peter, pastor, 1207½ 11th St., and 4th Lutheran Church, R. C. Shindler, pastor, 1416 3rd St., combined church. $150,000. **Maturity probably in spring.** Architect not selected.

Ont., Ottawa—Noffke-Morin & Sylester, archts., Medical Arts Bldg., bids early 1931, general contract new church, Elgin St., for Know Presbyterian Church, Ottawa. $250,000.

BIDS ASKED

N. J., Dumont—Poggi & Bragdon, archts., 275 Morris Ave., Elizabeth, bids about Feb. 1, general contract 2 story, basement, brick, steel, parish house, for First Methodist Church. $150,000. Noted May 29.

CONTRACTS AWARDED

N. J., Bordentown—E. G. Perrot, archt., 1211 Arch St., Phila., Pa., general contract 3 story, basement, brick, steel addition to monastery and new chapel, plain found., to W. R. Dougherty, 1608 Sansome St., Phila., Pa., for Franciscan

Constr. News page 261

Churches (Continued)

Monastery of St. Clair: plumbing and heating, to P. S. Slack, 211 Ferry St., Trenton; electrical work, to A. Bennsel, Bordentown. Est. $150,000. Noted Oct. 9.

SCHOOLS

PROPOSED WORK

Calif., Los Angeles—University of California, 405 Hilgrade Ave., Westwood, Los Angeles, plans by Allison & Allison, California Reserve Bldg., 2 rein.-con., brick, stone, gymnasiums, one for girls, other for boys. Westwood $400,000 each.

Calif., San Francisco—City and San Francisco Co. plans by Miller & Pflueger, 58 Market St., George Washington High School, rein.-con., steel, 30th and 31st Aves., Geary and Balboa Sts. $1,500,000. Noted July 17.

Conn., Canton—Tom F. J. Penley, 74 Hinsdale Ave., Winsted, Junior-Senior High School. $150,000. Architect not selected.

Conn., New Haven—Yale University, Trustee Yale University, sketches by C. Z. Klauder, 1429 Walnut St., Phila., Pa., addition to Peabody Museum, Sachem and Prospect Sts. To exceed $150,000.

Conn., Storrs—Connecticut Agriculture College, C. C. McCracken, pres., farming unit school. $150,000 or more. Architect not selected.

Ill., Elsah—Principia School, 5457 Page Blvd., St. Louis, Mo., plans by B. Maybeck, Berkeley, and takes bids in spring (1st unit) group brick, stone, English Country House design college buildings, incl. administration, power house, gymnasium, dormitories, library, chapel, water drainage, improving roads, athletic field, on 1,300 acre site, near here. $3,500,000.

Ky., Anchorage—Catholic Diocese of Louisville, F. R. Cotton, secy., 4115 South 3rd St., Louisville, institution, 220 acre tract land, near here. $500,000-$750,000.

Me., South Portland (br. Portland)—City, Superintendent Schools, 2 story, basement, brick school. $150,000. Architect not selected.

Md., Baltimore—Friends School, Park Ave. and Laurens St., plans by Mottu & White, 527 North St. Charles St., school, Charles St. and Wyndhurst Ave. $150,000.

Md., Chestertown — J. J. Raskob, 230 Park Ave., school or school and convent. $150,000. **Maturity indefinite.**

Mass., Belmont — Town, School Building Comn., revised plans by G. E. Robinson, 80 Federal St., Boston, 1 story, basement, brick, stone, plain found., School St. $150,000. Noted Oct. 30.

Mass., Watertown—Town, C. P. Chase, chn. Building Comn., 6 Patten St., revised plans by Haven & Hoyt, 45 Bromfield St., Boston, and soon takes bids, altering and constructing 2 story, basement, brick, steel addition to Junior High School, plain found., Boylston St. $200,000. Noted Apr. 10.

Mass., Wayland—Town, high school. To exceed $150,000. Selecting new architect. Noted Mar. 20.

Mass., Winchester — Town, H. W. Stevens, chn. Bd. Selectmen, plans brick, high school addition, Main St. and Mystic Valley Parkway. $200,000. Architect not selected.

N. J., Avenal—Bd. Educ., School Bldg., 2 story, basement, brick, steel, plain found. $150,000. Project in abeyance. Noted Oct. 30.

N. J., Butler — Bd. Educ., High School, sketches 2 story, basement, brick, steel, rein.-con. addition to high school, Bertholdi Ave. $200,000. Noted Dec. 18.

N. J., Elizabeth — Bd. Educ., 417 South Broad St., 3 story, basement, brick, steel, rein.-con. addition to Junior High School, plain found., Loomis St. $150,000. Project in abeyance. H. B. Brady, Inc., 333 North Broad St., archt. Noted Oct. 9.

N. J., Hillside (br. Elizabeth)—Bd. Educ., 2 story, basement, brick, steel high school. $150,000. Architect not selected.

N. J., Jersey City—Bd. Educ., Harrison Ave., 3 story, basement, brick, steel, school, Crescent Ave. $300,000. Project in abeyance. Noted Apr. 4.

N. J., Manasquan—Bd. Educ., bids after Feb. 1. 3 story, basement, brick, steel, rein.-con. high school. $250,000. Coffin & Coffin, 522 5th Ave., New York, archts. Noted Sept. 18.

N. J., Margate — Bd. Educ., 2 story, basement, brick, steel school. $150,000. Architect not selected. **Maturity indefinite.**

N. J., Princeton—Princeton Theological Seminary, 2 story, basement, brick, steel administration and social center, campus. $900,000. Project in abeyance. C. Z. Klauder, 1429 Walnut St., Phila, Pa., archt. Noted Oct. 30.

N. Y., Batavia—Dpt. Standards & Purchase, State Office Bldg., Albany, plans by Architectural Div., Albany, dormitory at New York School for Blind. To exceed $150,000.

N. Y., Oswego—Dpt. Educ., Education Bldg., bids in February, Industrial Teachers Training Building, 80 x 200 ft., brick, at New York State Normal School. $300,000. Noted Jan. 9.

Pa., Coraopolis—Bd. Educ., W. Hollisinger, pres., 1014 Ridge Ave., sketches by E. Stotz, Bessemer Bldg., Pittsburgh, Junior High School 2 story, brick, steel, Ridge and School Sts. $150,000.

Pa., Coraopolis — Bd. Educ. W. Hollisinger, pres., sketches by E. Strotz, Bessemer Bldg., Pittsburgh, Lincoln Grade School, 2 story, brick, steel, Ridge and Ferree Sts. $150,000.

Constr. News page 262

Pa., Pittsburgh—Bd. Educ., H. W. Cramblet, secy., Administration Bldg., Forbes St. and Bellefield Ave., plans by J. T. Steen & Sons, Vandergrift Bldg., Prospect Elementary and Junior High School, 3 and 4 story, basement, 240 x 250 ft., brick, steel, Southern and Prospect Aves. $600,000. C. L. Wooldridge, Inc., Fulton Bldg., consult. engrs.

R. I., South Kingston (mail Kingston)—Town of Kingston, K. Wilcox, chn. Bd., Junior High School. $150,000 or more. Architect not selected.

Vt., St. Johnsbury—Town, Superintendent Schools, high school and grade school. $150,000 or more. Architect not selected.

Ont., Kingston—Bd. Educ., 3 story, basement, concrete, brick, steel, stone technical and vocational school. $350,000. C. Drever, 81 Brock St., archt.

BIDS ASKED

Calif., Berkeley—Jan. 6, by G. B. McDougall, archt., 1 story, kitchen and commissary building, 2 story girls and boys dormitory buildings joined by covered passage, for California School for Deaf. $285,000. Noted June 26.

Del., Greenwood—Jan. 5, by Delaware School Foundation, A. J. Taylor, vice pres., Du Pont Bldg., Wilmington, general contract 3 story, basement, brick, steel, rein.-con. high school, plain found. $150,000. Guilbert & Betelle, 20 Branford Pl., Newark, N. J., archts. Noted Dec. 18.

Del., Lincoln City — Jan. 5, by Delaware School Foundation, A. J. Taylor, vice pres., Du Pont Bldg., Wilmington, 2 story, basement, brick, steel, plain found. $150,000. Guilbert & Betelle, 20 Branford Pl., Newark, N. J., archts. Noted Dec. 11.

Del., Wilmington — Jan. 5, by Mary and William School, Delaware School Foundation, Du Pont Bldg., 2 story, basement, 145 x 285 ft., brick, steel, rein.-con., 3rd St. between Adams and Monroe Sts. $400,000. Former bids rejected. Guilbert & Betelle, 20 Branford Pl., Newark, N. J., archts. Noted Nov. 20.

Mass., Stoughton — Immaculate Conception Roman Catholic Parish, T. P. Callahan, pastor, taking bids 2 story, basement, brick, stone, school, plain found., Atherton St. $150,000. W. B. Colleary, 80 Boylston St., Boston, archt.

Mich., Battle Creek—Jan. 5, by O. Adams, secy. Bd. Educ., 300 Highland Ave., 2 story, basement, 130 x 147 ft., brick, steel, rein.-con., plain found., Lakeview Dist. $150,000. Warren S. Holmes Co., Lansing, archts. Noted Dec. 11.

Mich., Detroit—Dec. 31, by C. A. Gadd, bus. mgr. Bd. Educ., 2 story, basement, brick, steel, stone, rein.-con. high school unit, plain found., Kelly Ave. $382,140. Smith, Hinchman & Grylls, 800 Marquette Bldg., archts.

Mich., Detroit—Jan. 7, by C. A. Gadd, bus. mgr. Bd. Educ., 1354 Broadway Ave., 2 story, basement, brick, steel, stone, rein.-con., plain found., Lappin and Verona Aves. $161,341. George D. Mason & Co., 409 Griswold St., archts.

Mich., Detroit—Jan. 8, by C. A. Gadd, bus. mgr. Bd. Educ., 1354 Broadway Ave., 3 story, basement, brick, steel, rein.-con., stone addition to intermediate school, plain found., Hawthorne and Russell Sts. $295,500. McGrath & Dohmen, 2231 Park Ave., archts.

Neb., Omaha—Jan. 30, by Bd. Educ., rein.-con., steel auditorium, gymnasium for school, Davenport St. $250,000. J. Latenser & Sons, Peters Trust Bldg., archts.

N. J., Plainfield—J. S. Pigott, archt., 42 Walnut St., Newark, bids about Feb. 15, general contract 2 story, basement school, Liberty St., for St. Mary's Roman Catholic Church, P. A. Maher, pres., 516 West 6th St. $300,000. Noted Oct. 30.

N. J., Washington — Bd. Educ., Boro Hall, bids about Feb. 1, 2 story, basement, brick, steel high school, Carlton Ave. $150,000. C. G. Jones, 133 Academy St., Belleville, archt. Noted Nov. 27.

O., Cincinnati—Jan. 12 by Bd. Educ., 210 East 9th St., 2 story, basement, 80 x 210 ft., brick, rein.-con., school, Montgomery Rd., $250,000. Hunt & Allen, Eagles Savings Bldg., archts.

Pa., Munhall—Dec. 29, by School Bd. Boro of Mulhall, 3 story, basement, brick, steel, 12th Ave. and Martha St. $150,000.

R. I., Providence—Dec. 29, by City, Public Building Dpt., 3 story, basement, 32 x 82 ft. and 1 story, basement, 83 x 140 ft., brick, steel, limestone, grade school, Broad St. $250,000. T. J. H. Pierce, City Hall, archt. Noted Dec. 18.

CONTRACTS AWARDED

Ill, Chicago—Bd. Educ., 188 West Randolph St., E. Whithall, bus. mgr., to W. B. Perry Co., 416 West Erie St., fireproofing Wendell Phillips Senior High School, rein.-con., brick, stone, incl. 3 gymnasiums, lunch room, laboratories, science hall, shops, lecture halls $109,850; to L. Vallas, 2848 West Lake St., roofing $13,230; to Ruda Mfg. Co., 2308 South Kedzie St., sheet metal $30,333; to New City Iron Wks., 2301 Ward St., structural steel $139,280, miscellaneous steel and iron $36,868, steel erection $58,900; to E. E. Young, 7553 Cregier St., carpentry $192,432; to P. Gottordo, 635 South Taylor Ave., Oak Park, painting $53,500; to Amer. Glass Co., 20 North Sangamon St., glass and glazing $24,543; to Vitrolite Glass Co., 20 North Sangamon St., structural glass $101,078; to W. Williams, 2841 Edgwood Ave., plastering $151,235, to Amer. Mosaic & Terrazzo Co., 1730 Carrol St., terrazzo and tile $122,283; to Corley Meservey Marble Co., 601 West 53rd St., marble $45,000; to H. P. Reger & Co., 159 North State St., steam heating $192,839; to Natl. Regulator Co., 2301 North Knox Ave., heat regulation $11,110; to G. E. Mathias Co., 5658 South Western Ave., ventilation $121,000; to S. Kersten, 554 West Jackson Blvd., plumbing $167,060; to Link-Belt Co., 900 South Michigan Ave., coal and ash conveyor $8,750; to Wadeford Electric Co., 205 West Wacker Dr., electrical work $231,538. Grand total $1,810,829. General contract, from Lind Constr. Co., 6404 South State St. $509,000; steel lockers, from Berger Mfg. Co., 228 North La Salle St., $19,587. Not yet awarded. Noted Oct. 23.

Ia., Ft. Dodge—E. L. Damon, Jr., archt., 19 East Mason Bldg., and F. W. Griffith, archt., 400 Shell Bldg., general contract Junior High School, 2 story, basement, rein.-con., brick, stone, to C. E. Larson Constr. Co., Ft. Dodge, $168,135; plumbing and heating, to Ft. Dodge Heating & Plumbing Co., Ft. Dodge, $44,027, for Bd. Educ., c/o E. Peterson, secy. Noted Dec. 4.

La., New Orleans—Orleans Parish School Bd., B. M. Palmer Scholo, 3 story, 136 x 273 ft., brick, stucco, to O. M. Gwin Constr. Co., 3501 Fern St., $206,200. Noted Nov. 13.

Md., Baltimore—Children's Hospital School, W. S. Baer, 41st St. and Green Spring Ave., 3 story, basement, 104 x 110 ft., marble, stone, brick, granite school, gymnasium, swimming pool, to Frainie Bros., 19 West Franklin St., $350,000. Noted Sept. 18.

Mass., Roslindale (sta. Boston)—City of Boston, Dpt. School Buildings, 2 story, basement, brick, stone, school, plain found., Charles Sumner Dist., Poplar St., to J. A. Singarella, Park Sq. Bldg., Boston, $203,425. Noted Dec. 4.

Mich., Ishpeming—Bd. Educ., 2 story, basement, brick, steel, rein.-con., stone high school, plain found., to F. Tomlinson, Ashland, Wis., $224,500; heating, to O. J. Dykman, Grand Rapids, $43,555. Noted Oct. 2.

N. J., New Brunswick — York & Sawyer, archts., 100 East 42nd St., New York, general contract 3 story, basement, 165 x 190 ft., gymnasium, College Field, to Highland Park Building Co., 238 Cleveland Ave., for Rutgers University, J. Thomas, pres., College Ave. Est. $600,000. Noted Dec. 4.

R. I., Portsmouth — Portsmouth Priory School, S. W. Knowles, pastor, Corey's Lane, 3 story, basement, 50 x 120 ft. and ell, brick, limestone, steel dormitory, plain found., Corey's Lane, to C. H. Hodgate Co., Bedford St., Fall River, Mass. Est. $150,000.

R. I., Providence—Brown University, C. A. Barbour, pres., 3 story, brick, steel addition to Faunce Hall, to Chas. B. Maguire Co., 507 Grosvenor Bldg. Est. $150,000. Noted Dec. 11.

Tex., Denton—College of Industrial Art, c/o H. N. Fitzgerald, chn., 3 story, 114 x 145 ft., brick, stone, rein.-con. dormitory with 59 x 69 ft. court, to Bailey, Burns & Fitzpatrick, 1202 Mercantile Bldg., Dallas, $118,500; plumbing, heating, to Martyn Bros., Inc., 911 Camp St., Dallas, $22,200. Noted Oct. 23.

Ont., Waterloo — Bd. Educ., 2 story, basement, brick, concrete, stone, to A. Schnarr, 48 William St. Est. $160,000. Noted Nov. 13.

Que., Montreal — Catholic School Comn., Thomas D'Arcy School, to J. A. A. Leclair & Dupuis, 620 Cathacart St., $348,000.

THEATRES

PROPOSED WORK

Colo., Longmont—Fox West Coast Theatres Corp., 1606 West Washington St., Los Angeles, Calif., sketches theatre, 900 seating capacity, $250,000. **Maturity indefinite.**

N. Y., New York—H. S. Diamond, 123 William St., New York, plans by H. I. Feldman, 415 Lexington Ave., theatre, stores, White Plains Rd. and Lydig Ave. $600,000. Noted Dec. 4.

N. Y., New York—Fox Theatres Corp., 850 10th Ave., theatre, 731 Lexington Ave. To exceed $1,000,000. **Maturity before Mar. 1.**

N. Y., New York — Seventh Avenue-50th Street Corp., c/o Earl Carroll Theatre, 42 story theatre, office, 7th Ave. and 50th St. To exceed $3,500,000. **Maturity in spring.** G. E. Keister, 56 West 45th St., and T. Lamb, 644 8th Ave., archts. Noted Sept. 25.

N. Y., New York—Todd & Robertson (contractors), 347 Madison Ave., bids in January, separate contracts amusement, radio studio development, for J. D. Rockefeller, Jr., and Metropolitan Square Corp., 61 Bway. Noted Oct. 16.

Tenn., Nashville—Warner Bros. Pictures, Inc., 321 West 44th St., New York, plans by Marr & Holman, Stahlman Bldg., 14 story, 92 x 242 ft., Bowling Green stone, Vermont marble theatre, office, 6th Ave. and Church St. $1,250,000.

BIDS ASKED

D. C., Wash.—Warner Bros. Theatres, 321 West 44th St., New York, bids about Jan. 15, general contract theatre, $1,000,000. J. Eberson, 370 Lexington Ave., New York, archs. Noted Dec. 11.

BANKS

PROPOSED WORK

Conn., Mystic—Mystic River Natl. Bank, E. S. Huntley, plans bank. $150,000. Architect not selected.

Ia., Des Moines—Bd. Directors Iowa-Des Moines Natl. Bank & Trust Co., L. C. Kurtz, chn., 6th and Walnut Sts., soon lets contract 5 story (ultimately 21 story), basement, 25 x 135

Banks (Continued)

ft. concrete, brick, stone bank, office, store, 6th and Walnut Sts. $1,500,000. Proudfoot, Rawson & Souers & Thomas, 810 Hubbell Bldg., archts. Noted Dec. 18.

Mass., Weymouth—Weymouth Trust Co., 92 Pleasant St., sketches by Harper & West, 2 State St., Boston, 2 story, basement, brick, stone, steel bank, Washington St. $150,000.

CONTRACTS AWARDED

Conn., Wallingford — Wallingford Bank & Trust Co., 28-34 Center St., 1 story, 35 x 110 ft., brick, steel, limestone, to Loucks & Clarke Co., Ernest St. $200,000. Noted Nov. 27.

Del., Wilmington—Fidelity Bank & Trust Co., 535 5th Ave., 15 story, basement 64 x 92 ft., bank and office to Fisher-Williams, 110 East 52nd St., New York, est. $500,000. Noted Nov. 27.

Mass., Framingham—Framingham Co-operative Bank, H. Davenport, 5 Irving St., remodeling 3 story, basement, brick, limestone, incl. office, plain found., to T. J. McMahon, 24 Union Ave. Est. $150,000. Noted Oct. 23.

N. J., Lambertville—Amwell Natl. Bank, general contract 1 story, basement, brick, steel, to J. F. Ferguson Co., 152 Market St., Paterson. Est. $150,000.

N. J., South Orange—South Orange Trust Co., 53 South Orange Ave., altering and constructing 2 story, basement bank addition, South Orange Ave., to State Builders, Inc., 24 Commerce St., Newark. Est. $150,000. Noted Dec. 18.

OFFICES

PROPOSED WORK

Calif., Sacramento — L. Lurie, 315 Montgomery St., San Francisco, 11 story, basement, steel, concrete, 7th and J Sts. $750,000. O'Brien Bros. & Peugh, 315 Montgomery St., San Francisco, Project indefinitely postponed. Noted June 19.

Pa., Bradford—R. A. Fulton & C. M. Hooker, plans by Lawrie & Green, 116 Locust St., Harrisburg, 7 story, basement, brick, steel, office, theatre, Main St. $750,000. Theatre leased to Paramount Publix Interests.

Utah, Ogden — Union Pacific R.R. System, H. C. Mann, ch. engr., 1416 Dodge St., Omaha, Neb., 13 story office. $1,000,000.

STORES

PROPOSED WORK

N. J., East Orange—Central-Sanford Realty Corp., H. Silvertone, pres., 624 Central Ave., plans by F. G. Hasselman, 34 Prospect St., 2 story, basement, 80 x 165 ft., brick, steel stores, offices, 583-95 Central Ave. $150,000.

N. J., Jersey City—M. Z. Hurwitz Co., M. Z. Hurwitz, pres., 921 Bergen Ave., brick, steel store, office, Newark Ave. and Barrow St. $250,000. **Maturity indenite.** Architect not selected. W. T. Grant Co., 455 7th Ave., New York, lessee.

N. Y., New York—Arndor Realty Co., A. E. Barnet, pres., 110 East 42nd St., 3 story, 52 x 147 ft., store, office, Park Ave. E and Tremont Ave. $150,000.

Pa., Johnstown—Glosser Department Store, Davis & Glosser, in charge, plans by H. M. Rogers, Johnstown Trust Bldg., Johnstown, 5 story, basement, 93 x 129 ft., incl. apartments, brick, steel, Locust St. near Franklin St. $250,000.

BIDS ASKED

Calif., Los Angeles—F. and W. Grand-Silver Stores, Inc., 337 Bway., bids Jan. 1, 6 story, basement, 60 x 165 ft., steel, rein.-con., terra cotta, 541 South Bway. $250,000. Walker & Eisen, 1117 Western Pacific Bldg., archts. Noted Dec. 11.

CONTRACTS AWARDED

N. J., Jersey City—F. W. Grand Stores, Inc., 906 Bway., New York, general contract rebuilding 3 story, basement, 50 x 100 ft., brick, steel, stores, office, 151-53 Newark Ave., to George Siegler Co., Inc., 24 Journal Sq. Est. $150,000.

N. Y., Flushing—Michaels Bros. Furniture Co., 5th Ave. and 9th St., Brooklyn, stores, storage and workshop, to E. Rothschild & Co., 342 Madison Ave. Est. exceeds $150,000. Contractor soon lets separate contracts. Noted Oct. 30.

LOFTS

CONTRACTS AWARDED

Calif., Los Angeles—Owl Realty Co., Metropolitan Bldg., 5 story, basement, rein.-con. loft, store, to A. V. Parkinson, 3977 South Vermont Ave., $175,000. Noted Dec. 11.

PUBLIC

PROPOSED WORK

Calif., Martinez—HALL OF RECORDS—Bd. Comrs. Contra Costa Co. sketches Class A building. $250,000 or more. Architect not selected.

Mass., Westboro—FARM—Commonwealth of Massachusetts, Dpt. Mental Diseases, group farm buildings on State Hospital grounds. $150,000. Architect not selected.

N. J., Hillsdale—MEDICAL—Dpt. Institutions & Agencies, State Office Bldg., Trenton, sketches by Guilbert & Betelle, 20 Brandford St., Newark, medical buildings. $150,000.

N. J., Menlo Park—HOME—State Bd. Institutions & Agencies, State Office Bldg., Trenton, plans by Div. Architecture & Constr., State Office Bldg., Trenton, New Jersey War Veteran's Home, 3 story, basement, brick, steel, $500,000. **Maturity in spring.** Brinley & Holbrook, 156 5th Ave., New York, assoc. archts. Noted Oct. 3, 1929.

N. Y., Albany—PRISON and STATION HOUSE—City, 3 story, basement, 75 x 120 ft., rein.-con., steel building for Precinct 1, plain found., Broad St., 10th Ave and 36th St. $150,000. Architect not selected.

N. Y., Beacon—DORMITORY—Dpt. Correction, State Office Bldg., Albany, bids in January, new female ward group, communicating corridor, auditorium, chapel, at Matteawan State Hospital. Noted Nov. 6.

N. Y., Montclair — LIBRARY — Bd. City Trustees, 2 story, basement, brick, steel, plain found., Church St. and Valley Rd. **Maturity early in spring.** Noted Dec. 11.

N. Y., New York — ART MUSEUM — City, Municipal Bldg., plans by J. R. Pope, 542 5th Ave., 2 and 3 story museum at Metropolitan Museum of Art, 5th Ave., 80th to 84th Sts. $3,350,000. Noted June 6, 1929.

N. Y., St. George — BORO HALL — J. A. Lynch, pres., Richmond Boro, Boro Hall, sketches by F. E. Wall, 576 Oakland Ave., Port Richmond, 3 story, basement, brick, steel addition, plain found., Bay St. $150,000.

Okla., Oklahoma City—CITY HALL, etc.—City defeated $600,000, 6 story, basement city hall and jail, 1st St.; $1,000,000, convention hall and civic center, 1st St.; $500,000, 3 new fire stations. G. F. Brown, City Hall, engr. Noted Dec. 4.

Pa., Pittsburgh — JUVENILE DETENTION HOME — Bd. Comrs. Allegheny Co. withdrew bids to have been opened Dec. 16, on account of legal technicality, 3 story, basement, 125 x 141 ft., brick, steel, limestone, 3333 Forbes St. $350,000. Will probably re-advertise in spring. S. L. Roush, 519 Smithfield St., engr. Noted Dec. 4.

BIDS ASKED

Conn., Simsbury—HALL—Jan. 3, by Town, Bd. Selectmen, Town Hall, 2 story, basement, 160 x 200 ft., brick stone, Enos Memorial town hall. $350,000. Smith & Bassette, 36 Pearl St., Hartford, archts. Noted Dec. 4.

Ill., Springfield—FAIR—Jan. 6, by State Div. of Architects & Engineers, Capitol Bldg., H. Hammond, supervr., 1 story 206 x 255 ft. fair buildings, incl. girls school exhibit, offices, rest room, Fair Grounds, for State of Illinois, Capitol Bldg. $200,000.

Ind., Hammond—CITY HALL—Dec. 31, by City, 4 story, basement, 75 x 195 ft., steel, limestone, incl. offices, Police Department, Maywood Park. $400,000. Buckley-Skidmore & Wainwright, 611 Hohman St., archts. Noted Nov. 13.

Kan., Alma—COURT HOUSE—Wabaunsee Co., A. N. Winkler, clk., bids about Jan. 7, 3 story, ground floor, 69 x 103 ft., rein.-con., brick, Carthage or Bedford stone. $150,000. W. E. Glover, 301 Natl. Reserve Bldg., Topeka, archt. Noted Nov. 13.

N. J., Hackensack—ADMINISTRATION—Bd. Freeholders Bergen Co., Court House, bids about Feb. 1, 6 story, basement, 200 x 400 ft., brick, steel, Main and Hudson Sts. $1,200,000. E. L. Tilton & W. F. Schwanewede, 420 Lexington Ave., New York, archts. Noted Nov. 20.

N. Y., Attica—PRISON—Jan. 27, by Dpt. Correction, State Office Bldg., Albany, administration, hospital, laundry and bath, shop and state shop buildings, textile shop, maintenance storehouse, ground lighting, plant telephone system, and addition for prison wall, at Attica State Prison. Noted Oct. 2.

N. Y., Central Islip — HOME — Jan. 7, by Dpt. Correction, State Office Bldg., Albany, reconstructing Veile Home, at Central Islip State Hospital.

N. Y., Elmira—REFORMATORY—Jan. 20, by Dpt. Correction, State Office Bldg., Albany, school and hospital building at Elmira State Reformatory. Noted Nov. 6.

N. Y., Great Meadows—ADMINISTRATION—Jan. 20, by Dpt. Correction, Albany, administration building at Great Meadow Prison. Noted Nov. 6.

N. Y., Syracuse—ARMORY—Feb. 5, by State Armory Bd., Albany, armory addition. Noted May 1.

N. Y., Thiells—FARM GROUP—Jan. 28, by Dpt. Mental Hygiene, State Office Bldg., Albany, farm barns and continuing construction, at Letchworth Village. To exceed $150,000.

CONTRACTS AWARDED

Ariz., Bisbee—COURT HOUSE—Cochise Co., c/o County Clerk, Court House, court house, to C. Campbell, Phoenix, general contract $175,797, extras $12,464; removing old jail equipment from Tombstone, and furnishing additional equipment, to Southern Prison Co., 450 South Prensa St., San Antonio, Tex., $15,480. Grand total $203,741. Noted Oct. 30.

N. Y., Auburn—CELL BLOCK—Dpt. Correction, State Office Bldg., Albany, general contract cell block, mess hall, kitchen and bakery, for Auburn Prison, to Wark Co., 1608 Walnut St., Phila., Pa., $907,950; heating, to Levine Plumbing & Heating Co., Inc., 520 East 11th St., New York, $227,400; sanitary work, to Barr & Creelman, 74 Exchange Pl., Rochester, $75,000; electrical work, to O'Connell Electric Co., 63 Mount Hope Ave., Rochester, $29,840. Grand total $1,330,190. Noted Oct. 30.

N. Y., Auburn—FIRE STATION—Police and Fire Dpts., 3 story, basement, brick, to D. Meagher, 311 Alexander St. $400,000. Noted Aug. 7.

N. Y., Dannemora—DORMITORY—Commissioner Dpt. Correction, State Office Bldg., Albany, general contract cottages for employees home, Dannemora State Hospital, to J. Johnson Constr. Co., Inc., 207 West Huron St., Buffalo, $114,810; heating, to Bareham & McFarland, Inc., 136 North St., Rochester, $5,921; sanitary work, to Hamaline Co., Inc., 529 Oriskany St., Utica, $7,890; electrical work, to J. M. Gettys, Rouses Point, $7,137. Grand total $135,758. Noted Oct. 30.

N. Y., New York—MEMORIAL—Bd. Trustees New York State Roosevelt Memorial, Museum of Natural History, 15 West 77th St., general contract Roosevelt Memorial, to J. H. McNally, 1860 Bway., $1,969,380; heating, to G. E. Gibbon Co., 60 Hudson St., $79,972; plumbing, to Moran Eng. Co., 51 East 42nd St., $41,975; electrical work, to Arc Electric Co., 330 East 39th St., $166,884; elevators, to American Elevator & Machine Co., 115 Cedar St., $56,032. Grand total $2,314,243. Noted Dec. 4.

Tex., Amarillo—COURT HOUSE—Potter Co. c/o S. B. Motlow, judge, 8 story, basement, 84 x 144 ft., rein.-con., Indiana limestone, to C. S. Lambie Constr. Co., Amarillo Bldg., $391,366; electric wiring, to Busby & Co., 4004 Main St., Dallas; plumbing, heating, to Johnson-Davis Co., Oliver Eagle Bldg.; jail equipment, to Southern Prison Co., 4500 South Presa St., San Antonio; elevators, to Otis Elevator Co., 108 Navarro St., San Antonio. Est. $420,000. Noted Nov. 20.

BUILDINGS—UNCLASSIFIED

PROPOSED WORK

Calif., Compton—MAUSOLEUM—Angelus Abbey Mausoleum Co., East Main St., plans by C. N. Aldrich, Pacific Southwest Bank Bldg., Long Beach, 2 story, 61 x 19 ft., 4,000 crypt addition, rein.-con., plaster, stone, marble, terrazzo, East Main St. $500,000.

Conn., New London—AUDITORIUM, etc.—William Memorial Institute, C. L. Buell, 110 Broad St., brick, steel auditorium, gymnasium. $160,000. Architect not selected.

Conn., Noroton Heights — HOME — Fitch's Soldiers' Home, soldiers' home unit, $200,000. Architect not selected.

N. J., Lakewood—MOTION PICTURE STUDIO—Lakewood Studio Co., G. H. Glass, c/o D. J. Scrocco, archt., 60 Park Pl., Newark, 2 story, basement, 10 story tower, 200 x 800 ft., brick, steel motion picture studio and radio broadcasting station, Pine Forest Manor. $1,000,000. Noted Nov. 13.

O., Cleveland—EXCHANGE—Ohio Bell Telephone Co., G. A. Kositsky, ch. engr., 750 Huron Rd., plans by A. W. Bailey, 750 Huron Rd., 2 story, steel, stone, concrete exchange addition, 15715 Kinsman Rd. $150,000.

CONTRACTS AWARDED

Calif., San Francisco—FILM EXCHANGE—Bell Bros., Mills Bldg., San Francisco, two 2 story, basement, rein.-con. buildings, Hyde and Eddy Sts., to Cahill Bros., 206 Sansome St., $100,000 each.

Mo., St. Louis—MERCHANDISING MART—Terminal Railroad Assn., 1800 Market St., 7 story, basement, 20 story tower, 330 x 358 ft. merchandising mart, to Gamble Constr. Co., 620 Chestnut St. $2,500,000. Noted Nov. 6.

N. Y., New York—EXCHANGE—New York Telephone Co., 1775 Grand Concourse, general contract exchange, to Chapman-Kruge, 155 East 42nd St. Est. $300,000. Noted Dec. 4.

Pa., Hershey—COMMUNITY CENTER—Hershey Estate, c/o Hershey Chocolate Co., community center, incl. general improvements, playgrounds, housing, day labor and separate and general contracts. $2,000,000.

Buildings

FACTORIES AND MILLS

PROPOSED WORK

Ark., Ft. Smith—PACKING PLANT—Banfield Brothers Packing Co., plans by Bonnell-Tohtz Co., 1515 North Grand Blvd., St. Louis, Mo., concrete and brick packing plant. $70,000.

Ark., Texarkana—BAKING PLANT—Butter Nut Bread Co., c/o A. C. Worthen & O. J. Johnson, Texarkana, rejected bids 2 story, basement, 73 x 135 ft., rein.-con., brick, 10th St. and State Line Rd. $50,000. Project indefinitely postponed. Witt, Seibert & Halsey, Texarkana Natl. Bank Bldg., archts. Noted Oct. 9.

Ill., Galesburg—FACTORY—Rome Mfg. Co., 614 West 3rd St., A. Y. Roine, pres., 1 or 2 story addition, West 3rd St. $50,000. Architect not selected.

Ky., Frankfort — FACTORY — State Dpt. Charities & Corrections, passed bill appropriating $45,000, automobile license tags factory at State Penitentiary. $45,000.

Me., Brownsville—PLANT—Brownsville Slate Co., c/o L. H. Alline, Presque Isle, plans altering and constructing addition. $40,000 to $50,000. Private plans.

Me., Buckfield — BROOM FACTORY — C. Witherton & Son, Buckfield, 2 story, brick, timber factory. $40,000. Private plans.

Mass., Boston — MANUFACTURING — Economy Umbrella Mfg. Co., 96 Essex St., rebuilding 4 story, brick, Essex St., recently destroyed by fire. $40,000 or more. Architect not selected.

Mass., Wellfleet — FACTORY — Powdrell & Alexander, Inc., 175 Conn Mills Ave., Danielson, Conn., sketches 1 story, brick, timber addition, Main St. $40,000. W. B. Brennan, 175 Conn Mills Ave., Danielson, Conn., engr.

Constr. News page 263

Factories and Mills (Continued)

Mo., Wellston—PACKING PLANT, etc.—J. Remley Co., 1315 Hodiamont Ave., St. Louis, plans by Bonnell-Tohtz Co., 1515 North Grand Ave., St. Louis, remodeling, rebuilding factory into meat packing plant and warehouse, constructing large retail market building, also installing spur railroad track into 30 acre tract, Kienlen and St. Louis Aves.

N. H., Seabrook — FACTORY — Seabrook Assn., J. Chase, reconstructing 2 story, brick, timber. $50,000. Architect not selected. Seabrook Shoe Co., lessee.

N. J., Hoboken—FACTORY—Garsten Realties Co., J. Bonanno, pres., 1827 Bergen Turpike North Bergen, brick, Madison and Jefferson Sts. $40,000 or more. **Maturity indefinite.** Private plans.

N. J., Jersey City—MILK DISTRIBUTION SYSTEM—Sheffield Farms, 524 West 57th St., bids after Jan. 15, general contract milk distribution plant. To exceed $100,000. Noted Dec. 18.

N. Y., Brooklyn—FACTORY—Wheeler Holding Corp., H. A. Wheeler, pres., plans by M. Marlo, 200 Beverly Rd., altering industrial and factory, Cropsey and Canal Aves. To exceed $40,000.

N. Y., New York—PRINTING PLANT—F. E. Finch, 136 Pearl St., 16 story publishing and loft building, 72 Front St. and 23 Old Slip. To exceed $600,000.

Okla., Clinton — MILK PLANT — Douthitt Eng. Co., 100 West Monro St., Chicago, Ill., sketches dried milk plant. $60,000. R. M. McCool, Clinton, engr.

Ore., Klamath Falls—PACKING PLANT—L. E. Walker (owner, archt. and engr.), rebuilding packing plant, office, Midland Roads, recently destroyed by fire. $50,000. Work will probably be done by day labor.

Pa., Oil City—DISTRIBUTING PLANT—Armour & Co., Union Stock Yards, Chicago, Ill., plans by R. C. Clark, c/o owner, brick, steel, Seneca St. **Maturity indefinite.**

Pa., Pittsburgh—CREAMERY—Corliss Creamery Co., N. L. Sappie, prop., 1762 West Carson St., plans by Braziell & Anderson, 309 4th Ave., 2 story, basement, 98 x 160 ft., brick, concrete, rein.-con., Reedsdale St.

Pa., Pittsburgh—MERCANTILE—Singer Sewing Machine Co., Walter Clough in charge, 149 Bway., New York, plans by Janssen & Cocken, Century Bldg., brick, limestone, 443 Wood St. $200,000.

Tex., El Paso—OXYGEN MANUFACTURING PLANT—Linde Air Products Co., El Paso (subsidiary of Union Carbide & Carbon Co., 30 East 42nd St., New York) 2 story plant, $100,000. Private plans.

Tex., San Antonio — BAKERY — El Fenix Bakery, c/o J. Estrada, 110 South Laredo St., purchased site and plans 43 x 110 ft., brick, concrete additional unit, incl. considerable machinery, equipment. $100,000.

Tex., Tahoka — TREATMENT FACTORY — See "Unclassified."

Ont., Dixie—PLANT—T. W. Hand Firework Co. Ltd., plant addition. $100,000.

Ont., Falconbridge — CONVERTERS and SMELTER PLANT — Falconbridge Nickel Mines, Ltd., Concourse Bldg., Toronto, structural, steel, metal and concrete addition, concrete found. $50,000. Private plans.

Ont., London—FACTORY—Hyatt Jumbo Roofing Co., 10 Aylmer St., Windsor, factory, Richmond St. $100,000. Private plans.

BIDS ASKED

N. J., Garfield—ICE PLANT—See "Contracts Awarded."

N. J., Newark—ABATTOIR—See "Contracts Awarded."

N. Y., Ossining—LAUNDRY—Jan. 20, by Dpt. Correction, State Office Bldg., Albany, laundry and bath building, at Sing Sing Prison. To exceed $40,000.

Pa., Vandergrift — CHEMICAL PLANT — Baker Findley Chemical Co., 1426 West 3rd St., C. C. Baker, pres., Cleveland, O., taking bids 1 story, 40 x 150 ft., concrete, brick, steel. F. Garrison, 310 Harrison Ave., archt.

CONTRACTS AWARDED

Ill., Crystal Lake—SERVICE HEADQUARTERS—Pub. Serv. Co. of Northern Illinois, 72 West Adams St., Chicago, service headquarters building, incl. garage, store rooms, operating departments, on 17 acre site, to C. E. Billings, Barrington. Est. $175,000.

Ill., Peoria — DAIRY — Hubbell & Baker, Knoxville Rd., R. F. D., 1 story, basement, 80 x 135 ft., steel, rein.-con., brick, incl. boiler fuel and refrigeration rooms, plain found., University St., to F. Harbers, 504 Central Bank Bldg. Est. $40,000.

Ind., Hammond—PLANT—W. J. Holliday Co., 545 West McCarthy St., general contract 220 x 225 ft., brick, steel, to Austin Co., 510 North Dearborn St., Chicago, Ill. Est. $100,000.

Kan., Wichita—BOTTLING PLANT—Ozarka Water Co., 215 South Washington St., 1 story, basement, 50 x 107 ft., rein.-con., brick, 1st and Washington Sts., to C. N. Startzman, 405 North Spruce St.; plumbing and heating, to Johnson Plumbing & Heating Co., 249 North Main St.

Constr. News page 264

Mass., Malden (br. Boston)—ICE CREAM PLANT—Atlantic Ice Cream Co., 899 Eastern Ave., Melrose, altering and constructing 2 story, brick addition, Hanover St., to Lucia Bros., 47 Cushing St., Medford. Est. $40,000.

Mich., Jackson—MANUFACTURING—Sparks-Withington Co., Jackson, manufacturing building to North Moeller Constr. Co., Jackson, est. to exceed $50,000.

Miss., Belzoni — ICE PLANT — Southern United Ice Co., F. I. McClandish, ch. engr., 30 ton brick, rein.-con., to S. P. Azwell, Belzoni.

N. J., Garfield—ICE PLANT—Garfield Crystal Ice Co., Midland Ave., 2 story, basement, brick, steel, Midland Ave. and Charles St., separate contracts. $75,000. Private plans.

N. J., Jersey City—GAS PLANT—Public Service Electric & Gas Co., 80 Park Pl., Newark, general contract 2 story, basement, 35 x 75 ft., brick, steel, rein.-con., Duffield Ave., to United Engineers & Constructors, Inc., 80 Park Pl., Newark. Est. $50,000.

N. J., Newark—ABATTOIR—Insel Bros. Co., 835 South 14th St., 2 story, basement, 100 x 150 ft., brick, steel, plain found., 225 Pacific St., separate contracts. Private plans. $40,000.

O., Youngstown—DAIRY PLANT—Youngstown Sanitary Milk Co., 715 Erie St., 2 story, basement, brick, steel, dairy plant and office, Erie St. to E. T. Linberger, 830 Market St. $150,000.

Pa., Pittsburgh — LAUNDRY — Sweet Clean Damp Wash Co., M. Hunter, in charge, 415-23 North Braddock Ave., 1 story, 30 x 124 ft., brick, steel, Lincoln and Deary Sts., to Navarro Co., 6219 Broad St. Est. $100,000.

GARAGES

PROPOSED WORK

Conn., Bridgeport—Dugan Bros., Inc., Glenwood Ave., plans by H. Holder, 242 Franklin Ave., Brooklyn, 1 story, 60 x 200 ft., brick, steel service building, Boston Ave. $60,000. Fletcher Thompson, Inc., 1336 Fairfield Ave., engrs.

Conn., Hartford—New England Electric Co., 103 Allyn St., soon takes bids brick, steel, concrete storage and service building, Spring and Church Sts. $75,000-$100,000. Westcott & Mapes, 139 Orange St., New Haven, archts.

Conn., Waterbury—Kaplan Bros., 352 East Main St., plans by T. M. Freney, 51 Leavenworth St., 1 story, basement, 60 x 115 ft., brick, steel, rein.-con. service and sales garage, plain found., East Main St. $40,000.

Mo., St. Louis—J. W. Kopman Constr. Co. (owner and contractor), 6304 South Rosebury Ave., will build 1 story, basement, 150 x 332 ft., rein.-con., brick garage, 50,000 sq.ft. floor space, Spruce St. between 15th and 16th Sts. American Ry. Express Co., c/o Railway Express Agency, Inc., 1730 Clark Ave., lessee. $150,000. Noted Dec. 11.

N. Y., New York—S. Mayer, 41 East 72nd St., 7 story service garage, 158 East 84th St. C. Schaefer, 41 East 72nd St., archt. **Maturity in summer.** Noted Dec. 11.

R. I., Providence—Autocar Sales & Service Co., 302 Pearl St., brick, concrete sales and service station, Branch Ave. $60,000. Private plans.

R. I., Providence—E. G. Page, 225 Fountain St., revised plans by F. Chiaverini, 32 Broadway, 2 story, 75 x 155 ft., brick, steel, super service station, plain found. $75,000. Former bids rejected. Noted Nov. 6.

Tex., El Paso—Hotel Hussman Co., El Paso, sketches large garage plant, addition to hotel. $230,000.

Va., Richmond—Guarantee Finance Corp., Mutual Bldg., Richmond, Va., and Kent Automatic Parking Garages, 350 Madison Ave., New York, plans by M. E. Wright, Amer. Natl. Bank Bldg., parking garage, shop, service station, 9th and Franklin Sts., $400,000.

CONTRACTS AWARDED

Me., Bangor—A. E. Webber, 75 West Bway., 1 story, 90 x 120 ft., brick, rein.-con., steel service garage, salesroom, plain found., West Broadway, to W. H. McPherson, 6 Webster Ave. Est. $50,000.

Mo., St. Louis—Firestone Tire & Rubber Co., c/o W. G. Sabine, local mgr., 4234 Forest Park Blvd., 1 story, rein.-con., brick, stone service station, incl. tire and tube department, brake relining, lubrication, gasoline and car washing dpts., 17,270 sq.ft. floor space, Delmar Blvd. at Hamilton Ave., to A. H. Stiel, 815 Chestnut St. Est. $50,000.

N. J., Jersey City—Motoramp Garages of New York, J. V. Coyle, pres., 250 Park Ave., New York, general contract 6 story, basement, brick, rein.-con., garage, Bergen Ave. and Academy St. to Fischer-Williams Corp., 110 East 42nd St., New York, est. $500,000.

Pa., Altoona—Goodrich Tire & Rubber Co., W. B. Thompson, in charge, 500 South Main St., Akron, O., 1 and 2 story, 49 x 163 ft., brick, steel super service station, incl. office, drive service, garage space in center, tire storage, wash rack, battery room, 12th St., to J. C. Orr & Son, 7th Ave. and 44th St. Est. $40,000. Noted Nov. 13.

See proposal advertising on page 84

Pa., Pittsburgh—F. A. Dontelli, 7202 Appel St., 2 story, basement, 50 x 50 ft., brick, tile garage, warehouse, apartment building, 7242-44 Forest Way, to E. E. Soxman & Son, 7233 Frankstown Ave. Est. $50,000.

SHOPS AND FOUNDRIES

PROPOSED WORK

Pa., Oil City — MACHINE SHOP, WAREHOUSE, OFFICE — Natl. Transit Co., F. D. Williams, pres., Seneca and Center Sts., 1 and 2 story, 156 x 285 ft., brick, steel, Seneca and Center Sts., to L. O. Boquin Co., 11 East 1st St.

R. I., Cranston (mail Providence)—MACHINE SHOP—Langelier Mfg. Co., H. K. Allard, pres., Washington St., Arlington, machine shop addition. $40,000. Architect not selected.

BIDS ASKED

N. Y., Napanoch—INDUSTRIAL—Jan. 20, by Dpt. Correction, Albany, storehouse and industrial shop, at State Institution for Defective Delinquents. Noted Nov. 6.

CONTRACTS AWARDED

Mass., Worcester—City, Public Building Dpt., City Hall, brick, concrete, city work shop, East Worcester and Shrewsbury Sts., to L. Rocheford & Son, Inc., 44 Front St., $38,500.

POWER PLANTS

PROPOSED WORK

Calif., Pasadena—City plans by Bennett & Haskell, 1st Trust Bldg., superstructure 108 x 150 ft. rein.-con. municipal light plant. $50,000.

La., Oakdale — City retained F. P. Joseph, consult. engr., Genmora, to submit plans on probable cost municipal light plant.

Mass., Brookline—Edison Electric Illuminating Co., 39 Boylston St., Boston, 1 story, brick sub-power station, Beaconsfield Rd. $40,000-$50,000. Private plans. Noted June 5.

N. Y., Bedford Hills—Dpt. Correction, State Office Bldg., Albany, preliminary plans power plant, additional boiler capacity, stokers, refrigeration, storage and laundry, at New York State Reformatory for Women.

Tex., Yoakum—Soon takes bids waterworks, incl. installing mains, pumping plant, fire plugs, meters. $250,000. Montgomery & Ward, Harvey-Snider Bldg., Wichita Falls, engrs. Noted Dec. 11.

CONTRACTS AWARDED

Ill., Chicago—Commonwealth Edison Co., 72 West Adams St., masonry and carpentry contract 1 story, 73 x 118 ft. brick addition to laboratory, to H. W. Green Constr. Co., 400 West Madison St. $50,000.

Ind., Goshen—City, new building to house electric generating plant, to Rieth-Riley Constr. Co., Goshen, $27,464. Noted Aug. 21.

Ind., Evansville — Bd. Comrs. Vanderburgh Co., steel, brick power plant, at County Infirmary, to W. Gravel, 317 Edgar St. Est. $65,000.

WAREHOUSES

PROPOSED WORK

Calif., Los Angeles—Hancock Park Warehouse Corp., c/o R. Falkenrath, Jr., Chamber of Commerce Bldg., two 60 x 300 ft., rein.-con. buildings, Pico Blvd. and Highland Ave. $600,000.

Conn., Bridgeport — New Era Constr. Corp., R. D. Zappone, 511 5th Ave., New York, storage warehouse, Noble Ave. and Harriett St. $100,000. Architect not selected.

Conn., New Haven—Smedley Co., 165 Brewery St., rebuilding brick or concrete warehouse, Chapel St., recently destroyed by fire. $100,000. Architect not selected.

BIDS ASKED

N. J., Irvington (br. Newark)—T. J. Lee, c/o N. J. Convery, archt., 32 Walnut St., Newark, revised plans 2 story, basement, brick, steel, rein.-con. warehouse, showrooms, Lyons Ave. Former bids rejected. Noted Nov. 27.

Mass., Salem—Salem Waste Paper Co., 69 St. Peter St., taking bids 1 story, 45 x 125 ft. concrete storage building, St. Peter St. Ext. J. M. Grat, 175 High St., Boston, archt.

Mass., Watertown—New England Telephone & Telegraph Co., 50 Oliver St., Boston, soon takes bids 1 and 6 story, and wing, 85 x 265 ft. and 120 x 140 ft., brick, steel, rein.-con. warehouse, garage, concrete found., Coolidge Estate, Mt. Auburn and Grove Sts. To exceed $40,000. Monks & Johnson, 99 Chauncy St., Boston, engrs.

N. J., Hackensack — Standard Oil Co., M. Roberts, in charge, Bayway, 1 story, 50 x 80 ft. warehouse, 1 story, 25 x 50 ft. pump house, 1 story, 115 x 120 ft. garage, office, Hackensack River front. $150,000. Private plans.

N. J., Perth Amboy—Ballinger & Co., archts., 12th and Chestnut Sts., Phila., Pa., bids about Jan. 15, general contract 1 story, basement, brick, steel, warehouse, Fayeth and Read Sts., for Greenspan Bros., 226 Washington St. $150,000 or more. Noted Dec. 11.

Soft Snow's Easy

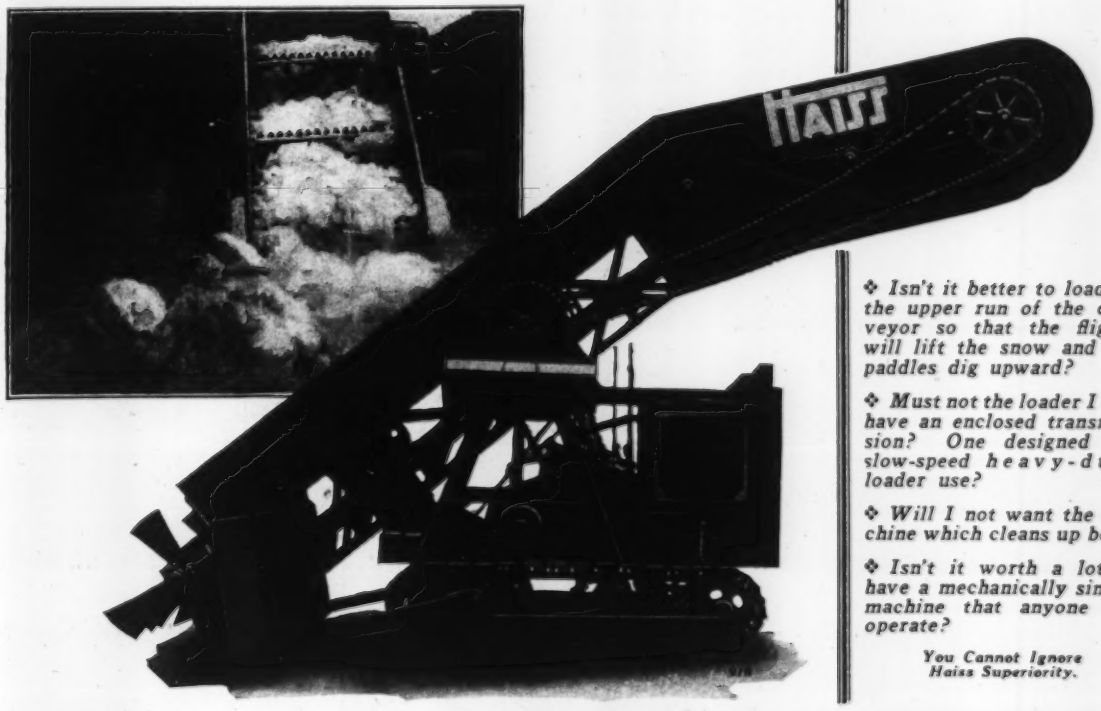
but you'll also have piles of

Frozen Snow

Here's a machine for loading snow where it really snows. Capacity? Up to 10 yards a minute. And, what's more, it is a digging snow loader—with a revolving-propeller self-feeding device that will cut right into a frozen snowpile. Look at the tooth-edged flights. They are more than scrapers; they *dig*. *Ask for Catalog 1027.*

Ask Yourself Questions such as:—

- *Is it wise to be ready for the worst conditions?*
- *Do I want a machine with a slow-speed worm drive for plowing effect while it is loading?*
- *Isn't it better to have a 10 yd. per minute capacity and save truck time?*



- *Isn't it better to load on the upper run of the conveyor so that the flights will lift the snow and the paddles dig upward?*
- *Must not the loader I buy have an enclosed transmission? One designed for slow-speed heavy-duty loader use?*
- *Will I not want the machine which cleans up best?*
- *Isn't it worth a lot to have a mechanically simple machine that anyone can operate?*

You Cannot Ignore Haiss Superiority.

GEORGE HAISS MANUFACTURING CO., INC.
140th St. and Rider Ave., New York, N. Y.

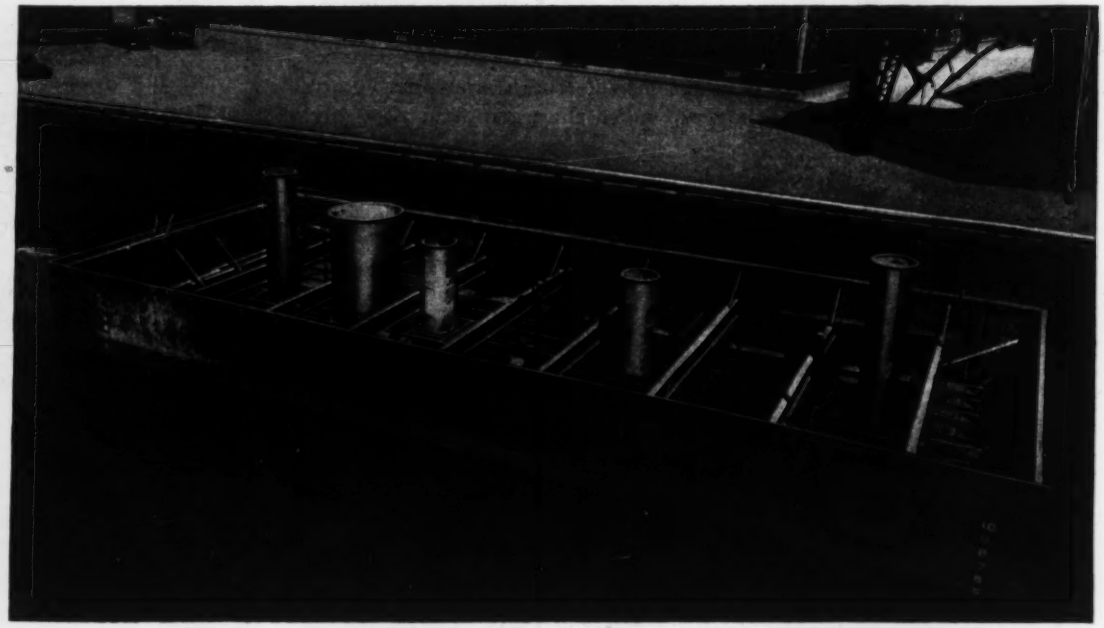
HAISS SNOW LOADERS

Also: HAISS "EXCAVATOR"—MODEL 27 TRUCK LOADERS—PORTABLE BELT CONVEYORS—CLAMSHELL BUCKETS

FEDERAL MISCELLANEOUS PRODUCTS

BRIDGE PIER CAISSONS

View of one of the pier caissons built for the Pennsylvania Railroad bridge, over the Passaic River at Newark, New Jersey. Contractors for pier work: Senior and Palmer, Inc. Dimensions of caisson: 36'-0" wide x 87'-0" long x 14'-0" deep.



Bridge pier caissons, ready to float into position, are one of a large variety of steel products manufactured by this company....Curved and bent plate structural steel fabrication, barges, pontoons, dredge booms and spuds, dipper handles, dredge pumps, tunnel shields, stacks, towboat engines, suspension bridge castings and other miscellaneous products involving heavy machining or fabrication are produced by an experienced organization.

US STEEL

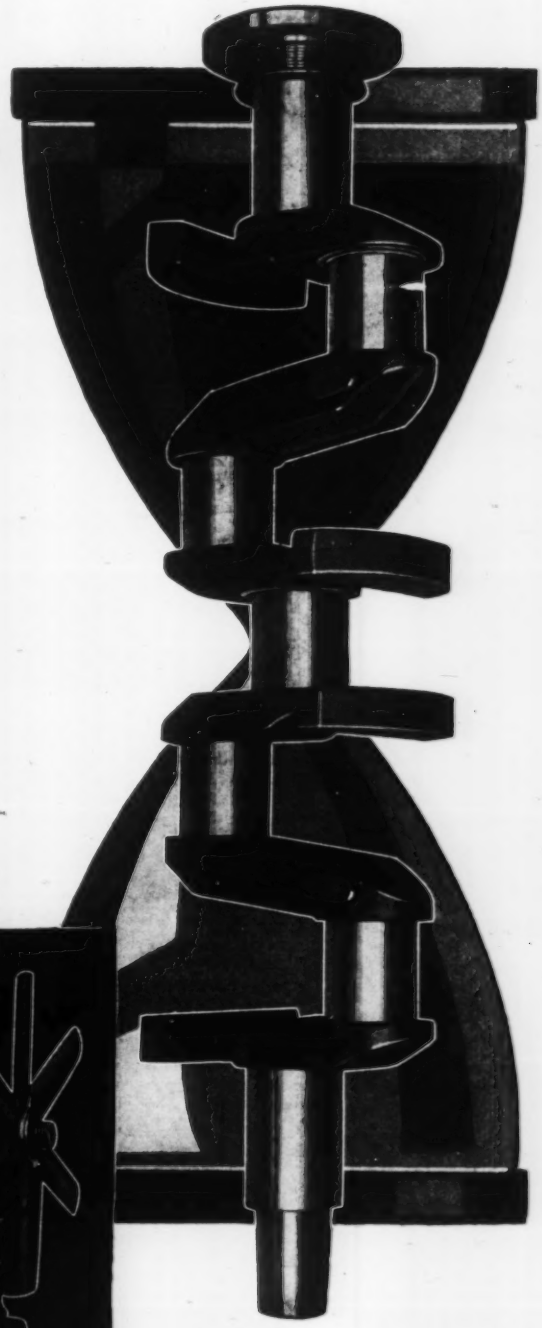
FEDERAL SHIPBUILDING AND DRY DOCK COMPANY

GENERAL OFFICES AND WORKS: LINCOLN HIGHWAY, KEARNY, NEW JERSEY

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

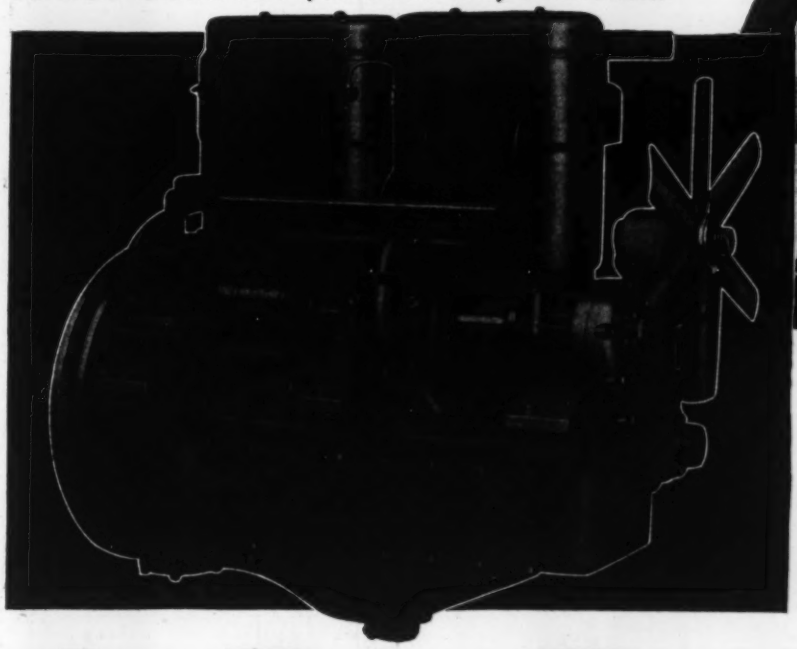
The LE ROI Crankshaft

is *guaranteed* for the life of the engine!



This massive backbone of the engine delivers its constant flow of power steadily, smoothly, masterfully . . . The finest steel that science can produce gives it a tremendous strength and stamina equal to the heaviest overloads. Its perfection of balance eliminates destructive vibration . . . There are times when the lifetime guarantee on the Le Roi crankshaft proves priceless . . . Le Roi Engines keep men and machinery moving . . . keep earnings constant . . . keep profits safe . . . Le Roi service is the utmost . . . it stands for Dependable Power.

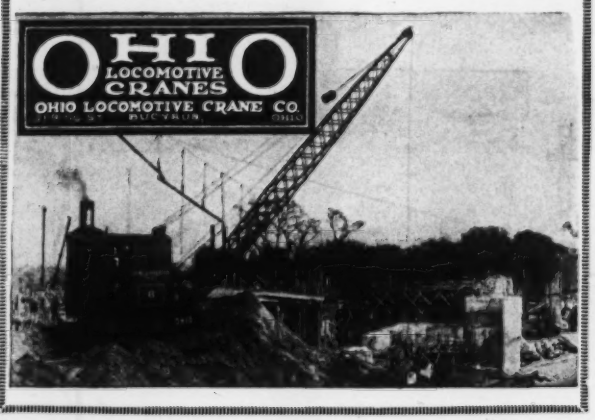
LE ROI COMPANY, *Milwaukee, Wisconsin*



FOR DEPENDABLE POWER

LE ROI ENGINES

OHIO LOCOMOTIVE CRANES
OHIO LOCOMOTIVE CRANE CO.



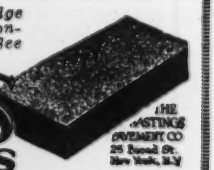
AIR COMPRESSORS
Built in sizes with displacements ranging from 1¾ to 360 cu.ft.
SCHRAMM, INC., MANUFACTURERS
West Chester, Penna.
SCHRAMM

VULCAN'S
pay their way on any hauling job
For your next job, of whatever nature, order VULCAN long life Locomotives. The same satisfaction given to the many VULCAN users can be given to you.
VULCAN IRON WORKS of Wilkes-Barre, Pa. U.S.A.
STEAM GASOLINE ELECTRIC LOCOMOTIVES

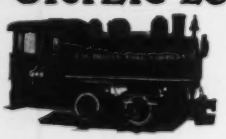
FRINK SNO-PLOWS
CARL H. FRINK
MANUFACTURER
CLAYTON 1000 ISLANDS NEW YORK

"The Dump Car that stands the grief" Western
WESTERN WHEELED SCRAPER CO.
AURORA, ILLINOIS

For industrial floors and bridge paving. No expansion. No contraction. No "bleeding." See full page alternate issues.
HASTINGS ASPHALT BLOCKS



PORTER LOCOMOTIVES



PORTER better built locomotives
for every industrial use
Ask for bulletins
H.K. PORTER CO.
PITTSBURGH, PA.

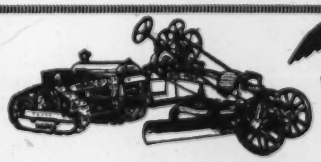
LOWER COSTS OF EXCAVATING
with the
SLACKLINE CABLEWAY EXCAVATOR
SAUERMAN BROS. INC
432 S. CLINTON ST. · · · · CHICAGO

RACOR
NINE WORKS
HILLBURN, NEW YORK
NIAGARA FALLS, N.Y.
CHICAGO, ILLINOIS
EAST ST. LOUIS, ILL.
PUEBLO, COLORADO
SUPERIOR, WISCONSIN
LOS ANGELES, CAL.
SEATTLE, WASHINGTON
NIAGARA FALLS, ONT.

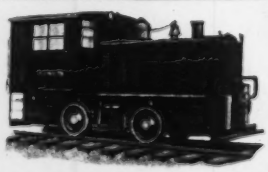
RAMAPO AJAX CORPORATION
Canadian Ramapo Iron Works Ltd. - Racor Pacific Frog & Switch Co.

RAILWAY TRACK MATERIAL
Switch Stands, Frogs, Switches, Crossings, Guard Rails, Clamps, etc.
MANGANESE WORK A SPECIALTY
General Office 230 Park Ave. New York
Sales offices at all mines

Graders
Crawlers
Scoops



WARCO BUCYRUS OHIO
W. A. RIDDELL CO. BUCYRUS, O.



PLYMOUTH
GASOLINE & DIESEL
LOCOMOTIVES
from 2 to 80 Tons
WRITE FOR PERFORMANCE BULLETINS
PLYMOUTH LOCOMOTIVE WORKS
Plymouth, Ohio

THE HUBER MANUFACTURING COMPANY
305 EAST CENTER ST., MARION, OHIO. · · · Send for Catalog
HUBER
4 CYL. MOTOR ROLLER

SECTIONS:
EC-22
EC-23.75
C-27
DC-25

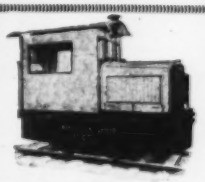
J&L STEEL PILING

Universal Interlock

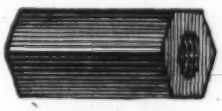
All general utility sections ⅜-in. material. Sections offer High Section Modulus for Weight of Material Used.

JONES & LAUGHLIN STEEL CORPORATION
AMERICAN IRON AND STEEL WORKS
PITTSBURGH

CARS KOPPEL TRACK
KOPPEL — for all engineering and industrial uses — KOPPEL
NEW YORK CHICAGO
KOPPEL INDUSTRIAL CAR & EQUIPMENT CO.
KOPPEL, PA. PITTSBURGH



MIDWEST LOCOMOTIVES
SIZES 4 TO 20 TONS
GEAR DRIVE
Write for Descriptive Literature.
MID-WEST LOCOMOTIVE WORKS, Hamilton, Ohio



Hex Couplings

Marion Hex Couplings are universally used as form ties, for butt jointing reinforcing and as inserts. Our illustrated folder describes other uses that cut construction costs. *Send for it today.*

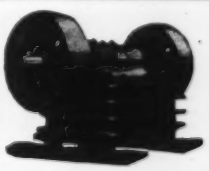
The Marion Malleable Iron Works
923 Miller Avenue,
Marion, Indiana

Certified malleable castings for every purpose.

We Design, Fabricate and Erect
RAILWAY AND HIGHWAY BRIDGES
STRUCTURAL STEEL
for Every Type of Building
Clinton Bridge Works, Clinton, Iowa

Athey TRUSS WHEEL 3-WAY DUMP TRAILERS
Dumps to Right, Left or Rear. . . . The ideal dirt moving unit for every job. . . . Low cost per yard is revolutionizing the dirt moving industry.
Write for complete information.
ATHEY TRUSS WHEEL CO. 130 North Wells Street, Chicago, U. S. A.
Cable Address "Truckwhl," Chicago
New Eastern connection depot, Foreign Representatives, Philadelphia, Pa.

Force Feed Rock Crushers
For All Purposes
26 sizes. Capacities up to 450 tons per 10 hour day. Thousands used by Quarries, Gravel Pits, Contractors, and Road Builders. INSTANT JAW ADJUSTMENT. MANGANESE STEEL EQUIPPED WITH OR WITHOUT ELEVATOR OR SCREEN. Write for new catalogue.
UNIVERSAL CRUSHER CO.
633 C. Ave. West, Cedar Rapids, Iowa



STANDARD *Asphalt Products*

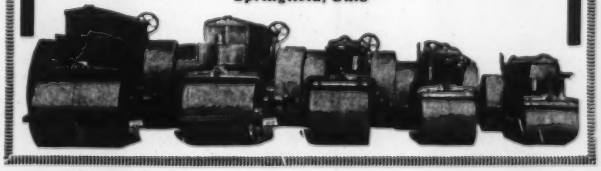
Standard Asphalt Binder A (Socony Brand) *for surface treatment.*
Standard Asphalt Binder B (Socony Brand) *for penetration work.*
Standard Asphalt Binder C (Socony Brand) *for the mixing method.*
Standard Cold Patch Asphalt (Socony Brand) *for repairing all types of bituminous road surfaces.*
Standard Refined Asphalt (Socony Brand) *for sheet asphalt paving.*
Standard Asphalt Joint Fillers (Socony Brand) *for brick or block pavements.*
Standard Paving Flux, Standard Bridge Asphalt and Preserving Oils (Socony Brand).

SOCONY ASPHALTS AND ROAD OILS

STANDARD OIL CO. of NEW YORK
26 Broadway

TRUCKTOR
TRUCK SPEED TRACTOR PERFORMANCE
Converts ANY standard truck, old or new, into high-speed truck-tractor, to work every day, everywhere, RAIN OR SHINE.
The TRUCKTOR Corp., 158 Wilson Ave., Newark, N. J.

Buffalo-Springfield ROLLERS
Responsible for more miles of durable pavement than can be credited to all other makes combined. Built in all practical weights and sizes. Three wheel and tandem. Write for descriptive booklet.
The Buffalo-Springfield Roller Co.
Springfield, Ohio



AYER & LORD TIE CO.

INCORPORATED

Railway Exchange

CHICAGO

Railroad Cross Ties—Timber Products—Lumber—Poles

Piling—Fence Posts

Wood Treatments and Preservation

PLANTS

Carbondale, Ill., Grenada, Miss., Louisville, Ky., North Little Rock, Ark., Montgomery, Ala.; Marine Ways-Paducah, Ky.

"CREOSOTE OIL PREVENTS DECAY"

CREOSOTED PINE and OAK

We can make prompt shipment from our large stocks on standard items. *Send us your inquiries.*

BROWN WOOD PRESERVING CO., Louisville, Ky.

*Creo-pine

Creosoted Southern Pine Products

Conduit and Cross Arms
Sub-Flooring
Block Floors

Poles and Piling
Cross Ties
Bridge Timbers
Structural Timbers

SOUTHERN WOOD PRESERVING CO.

ATLANTA, GA.

Treating Plants EAST POINT, GA. *and* CHATTANOOGA, TENN.

Sales Offices:

NEW YORK (10 East 43rd St.) · PHILADELPHIA (Land Title Bldg.) · PITTSBURGH (Dollar Savings & Trust Bldg.) · DETROIT (Buhl Bldg.)

CHATTANOOGA · CHARLOTTE, N.C. (Builders Bldg.) · TOLEDO

UNIVERSAL FORM CLAMPS

Universal form clamps tie forms for columns, risers, walls, slabs and hang forms from structural steel. Simple, adaptable, economical.

Send for catalog.

Universal Form Clamp Co.
975 Montana St., Chicago, Illinois

Creosoted Wood Conduit

Railroad Ties, Bridge Timbers, Piles, Poles, Paving Blocks and Lumber — Manufacturers of Cross Arms Signal Trunking and Wyckoff Conduit for Underground Wires.

The Wyckoff Pipe & Creosoting Company

Established 1881

OFFICE: 522 5th Ave., N. Y. WORKS: Portsmouth, Va.

Creosoted Ties, Piling, Poles and Timbers
Creosote oil
Docks for Ocean Vessels

AMERICAN CREOSOTE WORKS, INC.
New Orleans, La.

SAVANNAH CREOSOTING CO., INC.
Savannah, Ga.

MITCO

Registered Trade Mark

Steel Grating Stair Treads
Armorgrids

Write for booklets of interest to engineers and contractors.

HENDRICK MFG. COMPANY

Makers of Hendrick Perforated Metal Screens

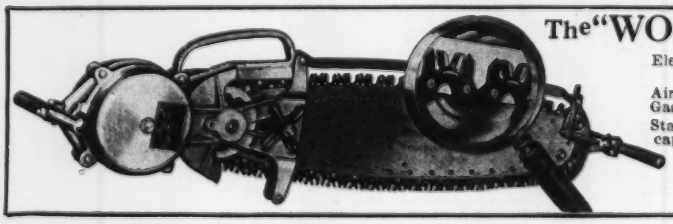
45 Dundaff St., Carbondale, Pa.
Koppers Bldg., Pittsburgh, Pa.
15 John St., New York, N. Y.

FLOOR NEVERSLIP PLATES

"The Plate with Perfect Diamonds"

AMERICAN PRESSED STEEL CO.
Commercial Trust Building—Philadelphia—Penn.

The "WOLF" Portable Timber Sawing Machine



Electric A.C. 110 and 220 volt, 60 cycle, 3 phase. D.C. 115 and 230 volt.

Air Driven—Ingersoll-Rand or Chicago Pneumatic equipped. Gasoline Driven.

Standard model has 24 in. capacity. However, machines of increased capacity as 36 in., 42 in. and 48 in. can be supplied to order.

REED-PRENTICE CORPORATION
Room 715, 41 Broad Street, New York City
Worcester, Mass.

GENUINE OPEN HEARTH IRON
GOHI
TRADE MARK
PURE IRON - COPPER ALLOY
REG U.S. PAT. OFF.

What is a GOHI Corrugate Culvert?

It is a culvert made of GOHI Genuine Open Hearth Iron, which is guaranteed to be 99.90% pure Iron-Copper alloy, the only metal of the kind in the world.

This remarkable metal has the greatest resistance to corrosion of any culvert metal known to science. Leading metallurgists confirm this and time has fully demonstrated it. Culverts installed 20 years ago are found to be practically perfect today.

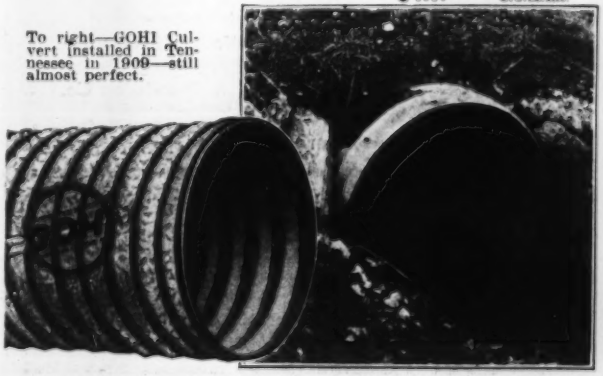
In addition to durability, GOHI Corrugated Culverts have the practical advantages of strength to meet all demands; flexibility that prevents cracking; ease of handling; quick low-cost installation; no repairs; no upkeep. Specify them for lowest-cost-per-year service. They meet copper-bearing pure iron requirements in all accepted specifications for Corrugated Metal Culverts.

GOHI CULVERT MFRS., INC.
Newport, Ky.

Capital City Culvert Co., Madison, Wis.
Central Culvert Co., Ottumwa, Iowa
Denver Steel & Iron Works Co., Denver, Colo.
A. N. Eaton, Metal Products, Omaha, Nebr.
Feenaughty Machinery Co., Portland, Oregon
Lincoln Steel and Forge Co., St. Louis, Mo.
Newport Culvert Co., Newport, Ky.
Pennsylvania Culvert Co., Philadelphia, Pa.
Roanoke Sales Corp., Roanoke, Va.
St. Paul Corrugating Co., St. Paul, Minn.
Tennison Brothers Oklahoma City, Okla.
Tennison Brothers, Texarkana, Ark.

© 1930 G.C.M.Inc.

To right—GOHI Culvert installed in Tennessee in 1909—still almost perfect.



These guard rail posts have been Zinc Chloride treated and painted

Protect Highway Timbers from ROT *with* GRASSELLI ZINC CHLORIDE

THE function of a wood preservative is to prevent rot, protect against insects and prolong the timber's span of life. Zinc Chloride does these things. But more . . .

Wood treated with Zinc Chloride is resistant to fire. It is clean, similar in color to untreated wood, and paintable. It is non-volatile and odorless.

Zinc Chloride treatment is economical in cost and saving in effect. Good sapwood grades when treated can be used in place of more expensive heartwoods.

Highway timbers, mine supports, structural woods—all can be made more serviceable, more lasting, more economical by treating with the standard "salt" preservative—Zinc Chloride.

The Grasselli Chemical Co.

Incorporated GRASSELLI Cleveland, Ohio

Branches in 19 Cities

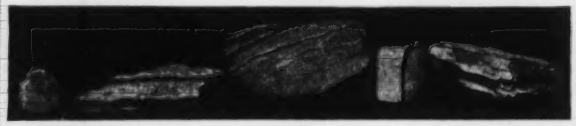
GRASSELLI ZINC CHLORIDE
For Wood Preservation

THE FRANCOIS CEMENTATION PROCESS

For grouting damsites, sealing leakages on dams, tunnels, shafts, pretreating rock and stabilizing foundations. This highly specialized cement grouting process has been successfully applied for years. The system was used on St. Paul's Cathedral, Leaning Tower of Pisa, and on many dams, etc. Investigate.

DRAVO

THE DRAVO CONTRACTING CO., PITTSBURGH, PA.



ANTI-HYDRO FOR PERMANENT CONCRETE HARDENS WATERPROOFS

FOR HARDENING & WATERPROOFING CONCRETE

A liquid integral hardner. Makes concrete dustless and waterproof. Used successfully for twenty-four years. Write for details.

ANTI-HYDROWATERPROOFING CO., 265 Badger Ave., Newark, N. J.

DRAVO

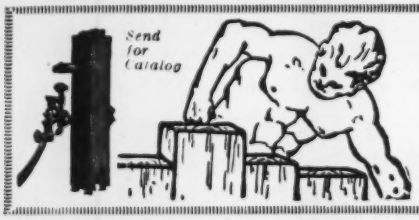
AMERICAN TUBULAR TOWERS

CONTRACTORS EQUIPMENT

DRAVO EQUIPMENT CO.

General Offices, Pittsburgh, Pa.

NEW YORK PHILADELPHIA CHICAGO CLEVELAND



California Pile Hammers

Warrington-Vulcan Pile Hammers

Vulcan Pile Extractors

Vulcan Iron Works
327 N. Irving Ave.,
Chicago, Ill.

CORE and WASH BORINGS

For Buildings, Dams, Bridges and all kinds of Minerals

Anywhere in the United States or Canada

SPRAGUE & HENWOOD, INC.

Main Offices SCRANTON, PA.

AMERICAN ASPHALT GROUTING COMPANY

Chattanooga, Tennessee

Licensed under Christians Patents

GUNITE

CONSTRUCTION COMPANY

Specializing in grouting and Cement Gun Work

Contracts taken everywhere—Estimates furnished

Room 1630 GRAYBAR BLDG., 420 Lexington Ave., N. Y. City

Telephone Mohawk 4 — 5675

Cement-Gun Work

ARTHUR J. WHITE CO.

Specialists in Gunite Construction

Contracts Taken Anywhere Estimates Furnished

1201 UNION TRUST BUILDING, PITTSBURGH, PA.

Phone Atlantic 0908

STEEL One order to Ryerson will take care of all your Reinforcing Steel, Metal Lath and other steel building materials. Immediate shipment assured.

Write for catalog.

Joseph T. Ryerson & Son, Inc., Plants at
Chicago Milwaukee St. Louis
Cincinnati Detroit Cleveland
Buffalo Boston Philadelphia
Jersey City

RYERSON

AMBURSEN DAMS

AMBURSEN CONSTRUCTION CO., Inc.

ENGINEER-CONSTRUCTORS

Grand Central Terminal, New York
Alexander Building, San Francisco

REINFORCING BARS

Rail Steel and Billet
Straight and Fabricated
Stock and Mill Shipment

LACLEDE STEEL COMPANY

Plants: Madison, Ill., Alton, Ill.

General Offices: Arcade Bldg., St. Louis, Mo.

Cement-Gun Construction Work

THE RUST ENGINEERING CO.

Engineers and Contractors on all kinds of Cement-Gun Work

2600 Koppers Building, Pittsburgh, Pa.

Chicago New York Birmingham Washington

UNDERPINNING AND FOUNDATION CO. 1ST CONSULTED—LAST EMPLOYED

HERCULES FOUNDATIONS

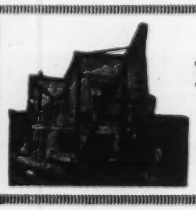
Quickly and economically installed
Contracts taken everywhere.

Underpinning & Foundation Co.
Engineers and Contractors
342 Madison Avenue, New York

DAM SITE TEST BORINGS

Longyear

MINNEAPOLIS MINNESOTA U.S.A.



NORBOM Hydraulic Dredges

built to suit your requirements.
Send for Catalog

The Norbom Engineering Co.
Darby, Pa.

"GUNITE'S" Remarkable Performance on Flue Repair and Construction

In 1917 The United States Smelting, Refining & Mining Company's smelter at Midvale, Utah, made what they thought temporary repairs to a corroded 15-ft. diameter steel flue, by coating exterior with "Gunite."

In 1921 The metal was practically gone from the inside, leaving only "Gunite."

TODAY The few remaining particles of steel having been chipped away, the original "Gunite" flue is still in perfect service.

ALSO A brick flue, encased in reinforced "Gunite," lost most of the bricks from its arch-top, yet still gave perfect service.

The above Company also built 200 ft. of flue *entirely* of "Gunite" (5½ ft. diameter with walls 1½ in. thick) concerning which after 6 years of service it reports "no maintenance charges."

REMEMBER *that there is only one "Cement-Gun" and that no other machine can place "Gunite." These machines are manufactured solely by us but are sold to anyone for unrestricted use. Any use of any other machine for placing "GUNITE" will be deemed an infringement of our rights and will be prosecuted vigorously.*

CEMENT GUN CO., Inc.
ALLENTOWN, PA.
New York Chicago Pittsburgh Atlanta Denver Salt Lake City
New Orleans Los Angeles Houston Seattle St. Louis

Why not let our Contract Department aid you, by furnishing an organization ready and able to make records?

Sash Operating Apparatus
for Every Type of Window
Lord & Burnham Co.
IRVINGTON, N. Y.

FOUNDATIONS
PRETEST UNDERPINNING
SPENCER, WHITE & PRENTIS
DETROIT NEW YORK CLEVELAND

We Look Into the Earth
By using Diamond Core Drills.
We prospect Coal and Mineral Lands.
We are fully equipped for testing foundations for bridges, dams, buildings, and all work of a similar character.
Pennsylvania Drilling Co.
Pittsburgh, Pa.
Drilling Contractors

Buckeye
TRENCH EXCAVATORS
AND
BACKFILLER-CRANES

The Buckeye Traction Ditcher Co., Findlay, Ohio

B
"Be Square" Products.

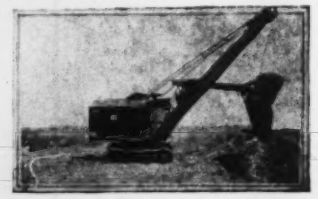
Barnsdall Admix
Insures permanently waterproof concrete and gives workability, quick hardening, greater strength, and corrosion resistance.
Incorporated 1892
American Tripoli Co., 1636 Arcade Bldg., St. Louis
Subsidiary of Barnsdall Corporation
Plant: Seneca, Mo., U. S. A.

Owen Buckets
Stronger and built to last longer, Owen Buckets get "A Mouthful at Every Bite" and More Bites Per Day.
THE OWEN BUCKET CO.
6011 BREAKWATER AVE. CLEVELAND, OHIO

Cement-Gun Work
NATIONAL GUNITE CONTRACTING CO.
ENGINEERS AND CONTRACTORS
Main Office, 82 West Dedham St., Boston, Mass.
Chicago Office: 549 West Washington St. 'Phone Central 3634
'Phone Commonwealth 4100
New York Office: 1849 Grand Cen. Term. Building 'Phone Murray Hill 9470
OTHER OFFICES
Buffalo, N. Y. Richmond, Va. St. Louis, Mo. Birmingham, Ala.
Cincinnati, Ohio Tulsa, Okla. Pittsburgh, Pa. San Benito, Texas

Lorain 45 • 55 • 75
Center drive shovels—cranes — clamshells — draglines—backdiggers — skimmer scoops — ¾, ⅞, 1, 1¼, 1½ yd. 5—20 ton cranes.
GAS, DIESEL OR ELECTRIC POWERED
THE THEW SHOVEL COMPANY
LORAIN, OHIO

TIREX Cable for electric shovels



TIREX Cable for electric shovels gives the efficient, profitable service that contractors need.

Simplex Wire & Cable Co.

MANUFACTURERS
201 DEVONSHIRE ST., BOSTON
BRANCH SALES OFFICES
CHICAGO, 564 W. Monroe St. SAN FRANCISCO, 390 Fourth St.
NEW YORK, 1328 Broadway CLEVELAND, 2019 Union Trust Bldg.
JACKSONVILLE, 1010 Barnett Nat'l Bank Bldg.

Standard of the world
PAGE

PAGE BUCKETS

Scraper—Clamshell—Backfilling

PAGE ENGINEERING CO.
Clearing Post Office, Chicago, U.S.A.

Hayward Buckets

A bucket for every digging and rehandling need . . . A size for every job.
THE HAYWARD CO., 48-50 Church St., N.Y.

ERIE BUCKETS

THERE is an Erie Bucket for every digging or rehandling requirement suitable to work on any crane or hoisting device.
Guaranteed to dig and stand hard service. Special Buckets in any size built on short notice.
ERIE STEEL CONSTRUCTION CO.
ERIE, PA.

Myers-Whaley Shovels for Tunnel Mucking

Unusual speed and reliability proved on many important tunnel jobs throughout the world. Ask for Tunnel Data.
MYERS-WHALEY COMPANY
KNOXVILLE, TENN., U. S. A.

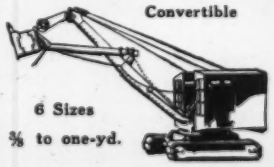
LOADMASTER
SWING-CRANE

Replaces manual labor. Works in close quarters. Lifts and hauls. Tractor mounted. McCormick-Deering powered. *Send for Catalog.*

Frederick H. Poor, Inc.
342 Madison Ave., New York City

No internal stress—longer wear
PREFORMED WIRE ROPE
TRU-LAY
TRADE MARK

Electric Traveling Cranes
Foundry Equipment
Special Machinery, Evaporators, Chemical Machinery, Pulverized Coal Equipment, Stokers.
Whiting Corporation
HARVEY, ILL. (Chicago Suburb)



Convertible
6 Sizes
⅜ to one-yd.

POWER SHOVELS
Full or part circle
Cranes, Trenchers
DRAGLINES
BAY CITY SHOVELS, Inc.
Bay City, Mich.

SPEEDER
SHOVELS CRANES
PULLSHOVELS DRAGLINES
SKIMMERS
Speeder Machinery Corporation
Pioneer Manufacturers of full revolving, fully convertible one-half yard gasoline shovels.
Cedar Rapids, Iowa, U. S. A.

½ yd. to 1¼ yds. CAPACITY
Fully Convertible

TERRY STEEL DERRICKS and DERRICK FITTINGS

For General Construction and Material Handling Work
AMERICAN-TERRY-DERRICK CO.
SOUTH KEARNY, N. J.

A. LESCHEN & SONS ROPE COMPANY

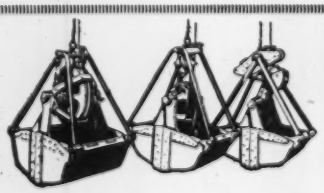
Manufacturers of
"HERCULES" (Red-Strand) WIRE ROPE
See our page advertisement that appears monthly in the second issue of this paper.

New York Chicago
5909 Kennerly Ave., ST. LOUIS
San Francisco Denver

WILLIAMS "Champions"

—the new series of WILLIAMS super-buckets. Guaranteed to outdig and outlast any other buckets. Write for Bulletin "E."

G. H. WILLIAMS CO.,
601 Haybarger Lane, Erie, Pa.
Branch Offices:
New York, Pittsburgh, Chicago



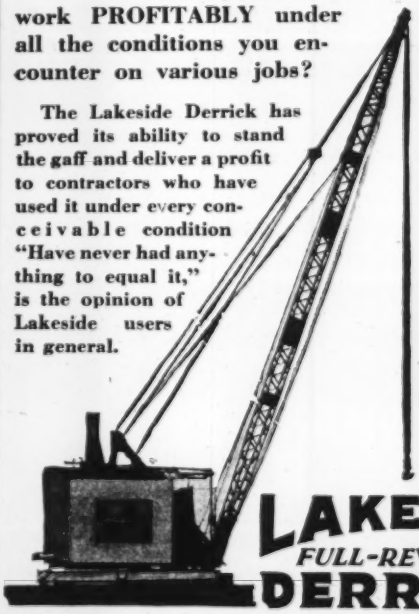
HAISS BUCKETS

A Type for Every Purpose
GEORGE HAISS MANUFACTURING CO. INC.
140th Street and Rider Ave., New York, N. Y.

The PROFITABLE Derrick On All Classes of Work

HERE'S the question that concerns you most regarding a full-revolving derrick: CAN IT BE DEPENDED UPON to do its work PROFITABLY under all the conditions you encounter on various jobs?

The Lakeside Derrick has proved its ability to stand the gaff and deliver a profit to contractors who have used it under every conceivable condition "Have never had anything to equal it," is the opinion of Lakeside users in general.



SEND FOR BULLETIN S-201

LAKESIDE BRIDGE & STEEL CO.
202 Villard Ave.
MILWAUKEE
WISCONSIN

LAKESIDE FULL-REVOLVING DERRICKS

The GOPHER Shovel Crane

Quality Engineering

AMERICAN HOIST & DERRICK CO.
Saint Paul, Minnesota

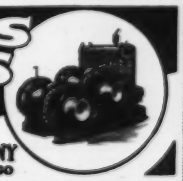
WILEY WHIRLEY

A travelling, revolving, long reach, heavy duty, steel derrick—simple, reliable, economical. Built since 1919. Write for illustrated catalog.

DAYTON-WHIRLEY CO.
DAYTON, OHIO

DRAGLINE — CLAMSHELL — CRANE

THOMAS HOISTS



THOMAS ELEVATOR COMPANY
20 SO. BOYNE AVENUE ~ CHICAGO

Hazard—The First Wire Rope—Since 1846

HAZARD WIRE ROPE COMPANY
WILKES-BARRE PENNSYLVANIA

New York Chicago Pittsburgh Philadelphia
San Francisco Denver Los Angeles Birmingham Tacoma
Fort Worth

BUCKETS

CLAMSHELL & DRAGLINE
Ball Bearing Dreadnaught Clamshell Buckets — Single Line Hook-on Buckets
Farmers Bank Building, Pittsburgh, Pa.

BLAW KNOX

For the Asking

This up-to-the-minute Pumping Handbook

Year after year this Novo Pumping Handbook is brought up-to-date to meet the requests of thousands of contractors, who are finding it a valuable aid in lowering their water handling costs. Consisting of a collection of pumping jobs from all over the country—on all types of work—detailed by pictures, facts and figures—the booklet can show you the way to better, cheaper pumping methods. Send the coupon today—no obligation.

NOVO ENGINE COMPANY
200 Porter Street—Lansing, Mich.
Clarence E. Bement
Vice-Pres. & Gen. Mgr.

NOVO
PUMPS—ENGINES—HOISTS

Please send me the Novo Pumping Handbook.

Name.....
Address.....
City.....*State*.....

"Pioneers in Meter Progress"

Of TRIDENT and LAMBERT Meters (the Cash Registers of the Water Works Field) over 5,000,000 made and sold.

NEPTUNE METER COMPANY
THOMSON METER CORP.
50 East 42nd St., New York City
Neptune Meter Co., Ltd., Toronto, Ont.

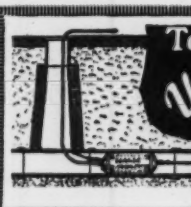
Yesterday Today Tomorrow

CORE JOINT
Economy in joint making
Only concrete pipe allowing a bituminous joint.
The Core Joint Concrete Pipe Co., Inc.
Irvington, N. J.

BRISTOL'S Recording Instruments
for Modern Water Works, Hydro Electric Plants and Railroads
for pressure, vacuum, draft, temperature, water level, electricity, mechanical motion, etc. *Write for Catalog 1800.*
The Bristol Company Waterbury, Conn.

PURE WATER
ROBERTS FILTERS
Gravity and Pressure Plants for all capacities.
ROBERTS FILTER MFG. CO.
618 Columbia Ave., Darby, Pa.

NATIONAL WATER MAIN CLEANING CO.
Before Cleaning
Clean Water Mains
Deliver Full Capacity
We are glad to confer with municipal officials or Water Companies.
National Methods are patented
After Cleaning
54 Church St., New York


To Stop the Flow in a Sewer
Use A GOODMAN
Cylindrical Stopper
SAFETY GAS MAIN STOPPER CO.
523 ATLANTIC AVE. BROOKLYN, N. Y.

Presstite Asphalt Sewer Joints
PRESSTITE
PRESSTITE ENGINEERING CO.
4067 Park Avenue
St. Louis, Mo.

The application of mathematics to all engineering work—

MATHEMATICS for ENGINEERS

By RAYMOND W. DULL
Research Engineer, Link-Belt Company.

780 pages, 5½x8, 686 illustrations, $5.00

THIS practical book has fifty-seven chapters of mathematical facts, covering every branch of engineering. This is more than a handbook providing tabulated solutions to average problems. It provides working methods which can be applied to every situation which arises.

Among the topics covered are absolute and relative errors—the slide rule—use of proportioned divider—the time element—calculus function of a function—limit of the rate of change for the differential calculus—etc.

See this book FREE—Mail coupon

McGRAW-HILL FREE EXAMINATION COUPON

McGraw-Hill Book Company, Inc., 370 Seventh Avenue, New York

You may send me on 10 days' free approval a copy of Dull's MATHEMATICS FOR ENGINEERS. $5.00 net postpaid. I agree to remit for the book or return it postpaid within 10 days of receipt.

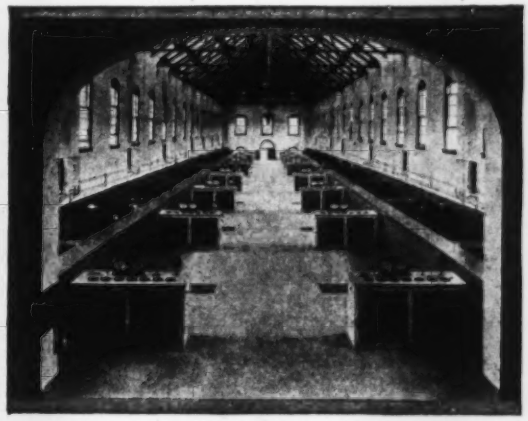
Name .....
Home Address .....
City and State .....
Position .....
Name of Company..... N.R. 12-25-30

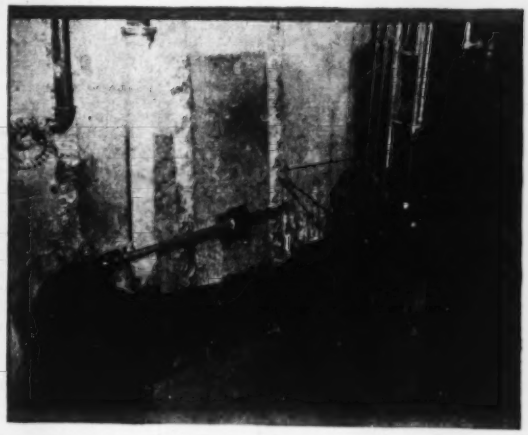
WATER SOFTENING AND FILTRATION PLANTS
AMERICAN WATER SOFTENER COMPANY
4th and LEHIGH AVES. PHILADELPHIA, PA.
No affiliation or working agreement with any of our competitors

HOOKER ELECTROCHEMICAL COMPANY
Manufacturers of
HIGH GRADE CHEMICALS
Eastern Plant—Niagara Falls, N. Y. Sales Office: 60 East 42nd St., New York
Western Plant—Tacoma, Washington Sales Office: Tacoma, Wash.

Laclede-Christy
ST. LOUIS
Segment Block
Patented
Vitrified, Salt-Glazed Sewer Pipe
K237

De Laval
Steam Turbine Co., Trenton, N.J.
Steam Turbines for all speed and steam conditions: capacities up to 15,000 hp. Catalog D-41. Double Helical Speed Reducing Gears. Catalog R41. Centrifugal Pumps, for all capacities. Catalog B41. Centrifugal Blowers and Compressors. Catalog F41. Worm Reduction Gears. Catalog R41. Flexible Couplings. Catalog K41. Water Wheels.





SIMPLEX CONTROLLERS AND GAUGES

Sixteen Simplex Controllers and sixteen Combined Loss of Head and Rate of Flow Gauges help make the Hackensack (N. J.) Water Company's New Milford installation a modern, efficient, well-equipped filtration plant. Total maximum capacity is 72 million gallons per day.

Specify Simplex for dependable control, and metering equipment. Send for details.

Simplex
VALVE & METER CO.
6747 Upland Street
PHILADELPHIA, PA.

SIMPLEX
TRADE MARK REG. U.S. PAT. OFF.

Filters and Softeners
For every industrial and domestic use.
Wm. B. Scaife & Sons Co.
Oakmont, Penna.
PITTSBURGH NEW YORK CHICAGO

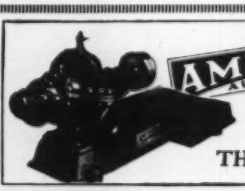
Save 25% to 50% by using
Wyckoff Wood Pipe
instead of Cast Iron Pipe
Lasts as long. Sizes 1 in. to 48 in. Pressure up to 172 lbs.
A. WYCKOFF & SON CO., ELMIRA, N. Y.
The originators of machine made wood pipe. Our 75th anniversary.
Branches: ATLANTA, GA., H. H. White, 1503 1st Nat. Bank Bldg.

HYDRO-TITE
Cast iron bell and spigot pipe joints, made with Hydro-Tite, are strong—flexible—and tight from the start. Write for literature.
HYDRAULIC DEVELOPMENT CORP.
50 Church St., New York, N. Y.
The Modern Joint Material

Miller Siphons (for flushing sewers)
and Sewage Disposal Apparatus
Downe's Covers—Sep. Sludge Tanks
For Catalogs write to
PACIFIC FLUSH-TANK COMPANY
4241 Ravenswood Ave., Chicago, Ill.
9 Park Place, New York City

VENTURI
METERS *and* CONTROLLERS
are used extensively in
Water Works—Filtration Plants—Sewage Disposal Systems—Hydro-Electric Stations and Industrial Plants
Write for Bulletins
BUILDERS IRON FOUNDRY
"Builders of the Venturi for 36 Years."
Providence Rhode Island

CEMENT LINED PIPE
Uses standard fittings with special lining
For Corrosive Waters
CEMENT LINED PIPE CO., Lynn, Mass.



AMERICAN
AURORA, ILL.
Manufacturers of Centrifugal Pumps, Deep Well Turbines and Deep Well Power Heads. Catalogs on request.
BRANCH OFFICES
NEW YORK, N.Y., ROOM 523, 165 BROADWAY
LOS ANGELES, CALIF., 529 E. THIRD ST.
CHICAGO, ILL., 20 N. WACKER DR.
THE AMERICAN WELL WORKS
General Offices AURORA, ILLINOIS and Factory

Nicholas Engel
JOHN FOX & CO.
Cast-Iron, Water, Gas and Flange Pipe, Special Castings, Fire Hydrants, Valves, General Foundry and Machine Work.
Woolworth Building, 233 Broadway NEW YORK CITY

A NEW, Easier

Way to Estimate

THE quick, simple chart system described in this book takes time and labor out of estimating construction costs. A glance at a chart takes the place of long and involved figuring in estimating labor and material costs for every branch of construction work. Simplifies and speeds up your estimating and makes it more accurate.

Estimating Construction Costs

By G. UNDERWOOD

Construction Engineer, Author of "Standard Construction Methods."

630 pages, 6x9,
443 charts, 36 illustrations,
flexible binding, $6.00

ENJOY this new tool that eliminates time and effort from estimating construction costs. All the tedious and detailed figuring, formerly a part of estimating, can now be avoided by consulting the clear, systematic charts that make up the larger part of this book. Furthermore this book presents a complete guide to estimating construction costs. It describes what costs should be applied—takes up the processes of estimating in detail—gives a complete model estimate that illustrates the principles advocated in a step-by-step demonstration of this new and simplified method.

Gives information not generally available

The 443 charts in this book cover all kinds of construction work, including steel, structural, machine erection, concrete working, and all the building operations. A chapter on transportation includes information and charts not readily available elsewhere and covers the cost of shipping materials by freight and express. There are also charts covering the moving of materials by hand, barrow, cart and truck. An entire chapter shows how to figure overhead. There is useful data on compensation and insurance costs in estimating. An entirely new method of estimating the cost of pipework is given, based on the number of joints.

Covers every phase of construction work

Chapter Headings:

1. Transportation of Materials.
2. Handling Materials.
3. Excavation.
4. Piling.
5. Concrete.
6. Wood Construction.
7. Brick, Tile and Stone.
8. Structural Steel.
9. Lathing and Plastering.
10. Roofing, Flashing and Waterproofing.
11. Pipe Work and Heating.
12. Plumbing.
13. Electrical.
14. Painting and Glazing.
15. Machinery and Machinery Erection.
16. Overhead.
17. Estimating.
18. Prices of Materials.

See this new book for 10 days free. You will find it an indispensable tool—helpful every time you want quick and accurate estimates. Send the coupon today. Examine the book for ten days. Pay for it only after you decide that it will repay you its purchase price many times over.

MC GRAW-HILL
FREE EXAMINATION COUPON

McGraw-Hill Book Company, Inc., 370 Seventh Avenue, New York.

Send me a copy of Underwood's **Estimating Construction Costs,** $6.00, postpaid, for 10 days' free examination. I agree to remit for the book or return it postpaid within 10 days of receipt.

Signed .....

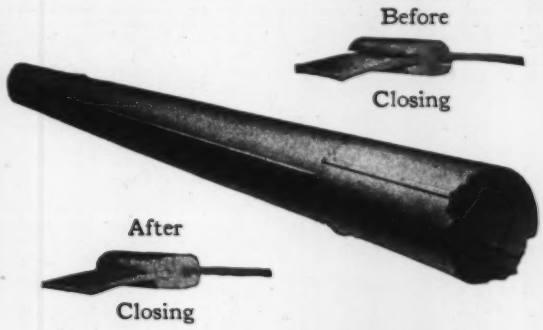
Address .....

City and State

Official Position .....

Name of Company .....

(Books sent on approval to retail purchasers in the U. S. and Canada only.) N.R.12-25-30



LOCK BAR STEEL PIPE

Prominent Water Works Engineers consider the twenty-five years of continuous service of Lock Bar Steel Pipe under favorable and unfavorable conditions assures the maximum of safety and efficient long life.

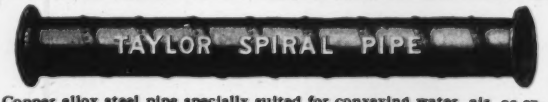
Lock Bar Steel Pipe with the 100% Lock Bar Joint and smooth interior has satisfactorily proved its dependability and lasting qualities.

Manufactured in 30-ft. lengths, except where shorter lengths are required to meet angles or curves in grade and alignment, with riveted taper circumferential field joints, it is easily handled and rapidly installed.

EAST JERSEY PIPE COPMANY
7 Dey Street, New York City

LOCK-BAR

Before Closing
STRONG AS THE PLATE ITSELF



Copper alloy steel pipe specially suited for conveying water, air, or exhaust steam. Has unusual light weight, strength, durability. Sizes 3" to 42" diameter. Lengths up to 40-ft. asphalted; 20-ft. galvanized.

TAYLOR FORGE & PIPE WORKS, CHICAGO
Box 485, Chicago 50 Church St., New York

UNIVERSAL CAST IRON PIPE

THE CENTRAL FOUNDRY COMPANY
Graybar Building: 43rd St. and Lexington Ave., New York
Chicago Birmingham Dallas San Francisco

no packing no calking no bell holes

One-Fifth The Weight of Pipe Cast Iron

One-Third The Weight of Wrought Pipe

AN ABSOLUTELY TIGHT DURABLE PIPE

The lap riveted seam repeats its cycle every twelve inches, forming a broad stiffening rib of great value, and makes Root Pipe one-third stronger than any other type of pipe construction. Light weight and simple connections reduce transportation, handling and erection costs. Suitable for conveying water, air gas, exhaust steam and powdered coal.

ABENDROTH & ROOT MANUFACTURING COMPANY
Pipe Specialists Continuously Since 1867. Sales Office: Woolworth Bldg., N. Y.

CAST IRON PIPE
- AND FITTINGS -

American Cast Iron Pipe Company
Birmingham, Ala.
SALES OFFICES IN PRINCIPAL CITIES

WATER CONTROL

without floats or fixtures

A constant water level can be automatically maintained in reservoirs, tanks and standpipes by the use of

GOLDEN-ANDERSON Automatic Cushioned Controlling Altitude Valves

These valves are always cushioned in closing and opening. They are extensively used for automatically maintaining a uniform stage of water in reservoirs, tanks and standpipes. No valves inside. No floats or fixtures, inside or outside of tanks. No freezing troubles. Three ways of closing these valves:

1st—Automatically, by water
2nd—By electricity, if desired
3rd—By hand

Remember: Valves cushioned at all times by air and water. No water hammer or bursting mains.

"Made with stop starter attachment for centrifugal pumps."

Golden-Anderson Valve Specialty Co.
1302 Fulton Bldg., Pittsburgh, Pa.

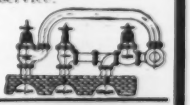
Pat. Automatic Double Cushioned Triple Acting Non-Return Valves

1. Prevent shut-downs due to reversal of steam flow.
2. Instantly close and isolate a boiler when a tube bursts.
3. Cut off steam flow from every boiler instantly when a steam pipe ruptures.
4. Automatically cut a boiler into line.
5. Prevent backflow into cold boiler.
6. The only valves that can be tested in service.

Angle Globe or Elbow Pattern

"4575"

Used by Steel Cos.



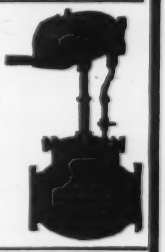
Patent Automatic Cushioned Controlling Float Valves

They carry a constant water level in feed water heaters by perfectly controlling the flow of makeup water.

Operated by protected enclosed copper float.

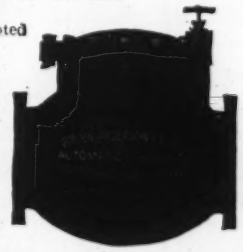
Cushioned by both air and water. Operate without hammering, sticking or chattering. No metal-to-metal seats. Made angle or straightway.

Sizes 1 in. to 30 in.



Pat. Automatic Double Cushioned Check Valves

1. Especially adapted for water service.
2. For high or low pressure.
3. Thoroughly cushioned. No chattering, hammering, or sticking.
4. Globe or angle patterns up to 30 inches.
5. Especially adapted for hydraulic elevator service.



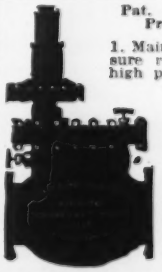
Pat. Automatic Cushioned Water Float Valves

1. Automatically maintain uniform water levels in tanks, standpipe, etc.
2. Instantly adjusted to operate quickly or slowly.
3. Floats swivel to any angle—most satisfactory float valves known.
4. No metal-to-metal seats—no water hammer or shock.
5. Cushioned by air and water.

Sizes ¼ to 24 in.

Pat. Automatic Cushioned Water Pressure Regulating Valves

1. Maintain a constant reduced pressure regardless of fluctuations on high pressure side.
2. Perfectly cushioned by water and air. No metal-to-metal seats.
3. The best valve made for maintaining a constant low pressure where consumption is continuous.
4. Operates quickly or slowly as required — No attention necessary.
5. Positively no hammering or sticking. Sizes to 24 in.



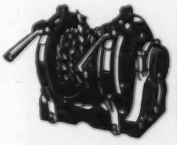
CENTRIFUGAL PUMPING MACHINERY

for Industrial Purposes, both for high and low pressure, hydraulic dredging, and sewage pumps. Also special pumps for various requirements.

KINGSFORD FOUNDRY & MACHINE WORKS
OSWEGO, N. Y.

A BULLSEYE IN TIME SAVING

This little hoist lifts a ton or pulls a 50-ton car. It's quicker and cheaper than hand labor. Send for Hoist Booklets.



Sullivan Machinery Company
124 S. Michigan Ave., Chicago

ERIE *Centrifugal* DREDGING PUMPS

For nearly 40 years users everywhere have found them a most profitable investment. Built for hardest service in handling sand and gravel. *See Bulletin 41.*

ERIE PUMP & ENGINE WORKS
152 Glenwood Ave., Medina, N. Y.

LC

LECOURTENAY CENTRIFUGAL PUMPS

3 MAINE ST., NEWARK, N. J.

STANDARD or SPECIAL PUMPS

To meet Individual Liquid Handling requirements is a LAWRENCE "VORTEX" specialty.

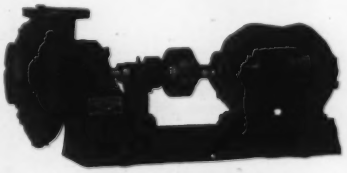


Fig. 119—Standard Motor Driven Centrifugal Pump

We offer you the correct type of unit, either standard or of special design to satisfactorily meet your conditions . . . .

Choice of alloys to best resist the liquid handled . . . .

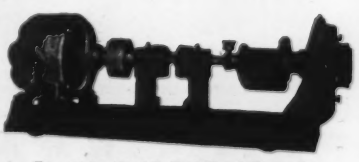


Fig. 130—Special Centrifugal Pump for Evaporating Vacuum Apparatus

Built to give economical and continuous service. . .

Let us furnish recommendations on your next pumping problem.

LAWRENCE PUMP & ENGINE CO.
P. O. Box 70 Lawrence, Mass.
New York Office—90 West St.

Bethlehem Steel Company

Design, fabrication and erection of steel for bridges, buildings, and other steel structures.

General Offices: **BETHLEHEM, PA.**

District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Cincinnati, Detroit, Chicago, St. Louis.

Pacific Coast Distributor: Pacific Coast Steel Corporation, San Francisco, Los Angeles, Portland, Seattle, Honolulu.

KELLOGG CHIMNEYS

Radial Brick and Reinforced Concrete

Send for booklet No. 60
"RADIAL BRICK CHIMNEYS"
or No. 70
"REINFORCED CONCRETE CHIMNEYS"

The M. W. Kellogg Company, Inc.
225 Broadway, New York, N. Y.

RADIAL BRICK CHIMNEYS
BOILER MASONRY
REFRACTORY BRICKWORK
WM. SUMMERHAYS SONS
CORPORATION
ROCHESTER, N. Y.
Established 1856

Boiler Settings—Chimneys

Ballard, Sprague & Company
Incorporated
25 East 26th St., New York, N. Y.

American Chimney Corp.
Main Office, 147 Fourth Ave., New York
BRANCHES:
Philadelphia Boston Cleveland Detroit
Brick Chimneys—Boiler Settings
give lasting service under severe operating conditions. Designed and built by men with long experience.

WEBER REINFORCED CONCRETE CHIMNEYS

MORE THAN THREE THOUSAND IN USE
Catalog sent free upon request.
Contracts executed in all parts of the world.
The Weber Chimney Company
1453 McCormick Building, Chicago
Sales offices throughout the world

CUSTODIS CHIMNEYS

RADIAL BRICK and REINFORCED CONCRETE

All sizes, for all purposes, for boilers, furnaces, chemical plants, destructors, etc. Experts in repairing chimneys. Lightning rods installed and repaired. Specifications and designs furnished free upon request.

Send for Free Booklets No. 313.
"How to Determine the Proper Size of Chimney" and "Treatise on Calculation of Stresses in Brick Chimneys."

Alphons Custodis Chimney Construction Co.
95 Nassau St., New York Marquette Bldg., Chicago

FORT PITT BRIDGE WORKS

OF PITTSBURGH, PA.

Bridges, Buildings, Structural Steel

General Office, Oliver Bldg., Pittsburgh, Pa., New York Office, 15 Park Row, Cleveland Office, Bulkley Bldg.
Purchasing Dept. and Works, Canonsburg, Pa.

THE
RUST ENGINEERING CO.

Koppers Bldg., 7th Ave. and Grant St.,
PITTSBURGH, PA.
CHIMNEYS — Brick and Concrete
Boiler Settings — Power Plants
New York Birmingham Washington Chicago

SEWAGE EJECTORS—CENTRIFUGAL PUMPS—AIR COMPRESSORS

Jennings Pumps

NASH ENGINEERING CO. SOUTH NORWALK, CONN.

"Buffalo" Pumps

Efficient Dependable
BUFFALO STEAM PUMP CO.
180 Mortimer Buffalo, N. Y.

FREDERICK SNARE CORPORATION

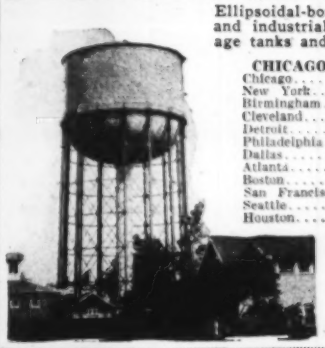
Harbor Works
Bridges
Railroads
Railroad Terminals
Warehouses

CONTRACTING ENGINEERS
Difficult and unusual foundation and engineering problems a specialty
114 Liberty Street, New York
Havana, Cuba, Paseo De Marti 110-A Altos. Philadelphia, 1524 Chestnut St.
Lima, Peru, Edificio "La Auxiliar"

Industrial Plants
Sugar Mills
Power Plants, Dams, Reservoirs, Pipe Lines, Tanks.

HORTON TANKS

Ellipsoidal-bottom tanks for municipal and industrial service. Standpipes, storage tanks and steel plate work.



CHICAGO BRIDGE & IRON WORKS

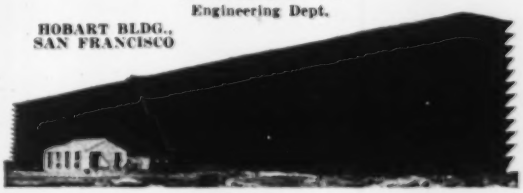
Chicago	2101 Old Colony Bldg.
New York	3111 Hudson Terminal
Birmingham	1520 Fiftieth St., North
Cleveland	2201 Midland Bank Bldg.
Detroit	1506 Lafayette Bldg.
Philadelphia	1626 Jefferson Bldg.
Dallas	3302 Magnolia Bldg.
Atlanta	2125 Rhodes-Haverty Bldg.
Boston	1507 Consolidated Gas Bldg.
San Francisco	1020 Rialto Bldg.
Seattle	1335 Smith Tower
Houston	1109 Electric Bldg.

Ask for a copy of our booklet, GRAVITY WATER SUPPLY

REDWOOD PIPE—TANKS— COOLING TOWERS

Designed— Manufactured— Erected

REDWOOD MANUFACTURERS CO.
ESTABLISHED 1889
Engineering Dept.
HOBART BLDG., SAN FRANCISCO



P.I.W. STEEL PLATE CONSTRUCTION

Elevated Tanks, Welded Pipe, Tank Cars, Stacks and Welded Boxes, Bins or Kettles—General Steel Plate Construction.

THE PETROLEUM IRON WORKS COMPANY, SHARON, PA.
Plant: Sharon, Pa.
Branch Offices: New York, Chicago and Tulsa

Ingalls STEEL Ingalls

For structural steel, standard steel buildings, steel roof and floor trusses, steel tanks, steel plate construction, write

THE INGALLS IRON WORKS CO.

Plants: Birmingham, Ala., Verona, Pa. *(In the Pittsburgh District).*
Offices: 117 Liberty St., New York, New Orleans, Tampa, Atlanta, Jackson, Miss.

TANKS & STACKS
STEEL PLATE PRODUCTS CO.
POTTSTOWN, PA.
STEEL PLATE CONSTRUCTION

WARREN CITY STANDPIPES

STEEL PLATE WORK OF EVERY DESCRIPTION

THE WARREN CITY TANK & BOILER CO.
Warren, Ohio

STEEL TANKS

ANY SIZE FOR ANY PURPOSE

PITTSBURGH-DES MOINES STEEL COMPANY
5 NEVILLE ISLAND - PITTSBURGH, PA.
DES MOINES NEW YORK CHICAGO ATLANTA DALLAS SEATTLE SAN FRANCISCO

COLE TANKS

STANDPIPES - PLATE WORK
ELEVATED TANKS
BOILERS - FLUMES - STACKS

R. D. Cole Mfg. Company
NEWNAN GA.
New York Office, 5 Beekman Street

MACHINERY and EQUIPMENT

Also see Page 29 This Issue

For all types of Movable Bridges
Special Machinery

STEELE & CONDICT

Manufacturing Engineers
DIVISION OF McKIERNAN-TERRY CORPORATION
13 Park Row, New York

The legal information every engineering man needs in his work—

BUSINESS LAW FOR ENGINEERS

By C. FRANK ALLEN
Member, Massachusetts Bar

THIS practical book is the work of a man who, trained in the law, has had his larger experience in engineering work and teaching. It is intended to furnish the engineer with an understanding of fundamental legal features which enter into his work—so that he may know when to proceed alone and when to seek professional advice. Topics covered include Contracts, Torts, Contract Letting, Agency, Equity, Sales, Negotiable Instruments, etc.

SEE THIS BOOK FREE

Simply mail this coupon

McGRAW-HILL
FREE EXAMINATION COUPON

McGraw-Hill Book Company, Inc., 370 Seventh Ave., New York.
You may send me for 10 days' free examination a copy of Allen's BUSINESS LAW FOR ENGINEERS. $4.00 postpaid. I agree to remit for the book within ten days or return it postpaid.

Signed .....
(Please Print)
Address .....
City and State .....
Official Position .....
Name of Company .....
(Books sent on approval to retail purchasers in the U. S. and Canada only.)
N.R. 12-25-30

AMERICAN BRIDGE COMPANY

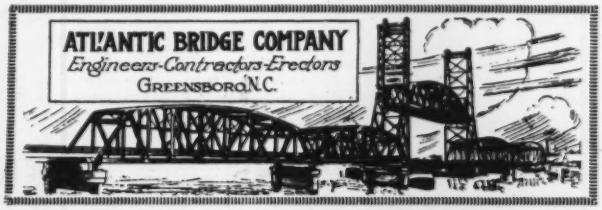
Subsidiary of United States Steel Corporation

Steel Structures Bridges and Buildings

GENERAL OFFICES
71 BROADWAY
NEW YORK
N. Y.

CONTRACTING OFFICES
IN PRINCIPAL CITIES

ATLANTIC BRIDGE COMPANY
Engineers-Contractors-Erectors
GREENSBORO, N.C.



SHOEMAKER BRIDGE COMPANY

Bridges and Buildings

NEW YORK POTTSTOWN, PA. PHILADELPHIA

WISCONSIN BRIDGE & IRON CO.,

NORTH MILWAUKEE WISCONSIN
Chicago Detroit Kansas City Los Angeles

THE TERRY AND TENCH CO., INC.

General Contractors
Steel Erection
Derrick Specialists
Grand Central Terminal
New York City

Works—Phoenixville, Pa.

The Phoenix Bridge Co.

—Bridges and Buildings—

Offices
Phila. New York Boston Rochester Washington

The Mount Vernon Bridge Co.

ENGINEERS AND MANUFACTURERS OF
Iron and Steel Mill Buildings and Structural Work
Railway and Highway Bridges, Roofs, Viaducts, etc.
MOUNT VERNON, OHIO

Steel Buildings, Bridges, Etc.

Virginia Bridge & IRON CO.

Roanoke Birmingham Memphis Atlanta
New York New Orleans Los Angeles
Charlotte Dallas El Paso

MILWAUKEE BRIDGE CO

Engineers Contractors Manufacturers

STEEL FRAMED STRUCTURES OF ALL KINDS

MILWAUKEE, WISCONSIN

INDEPENDENT BRIDGE CO.

OFFICE AND WORKS: NEVILLE ISLAND, PA.
NEVILLE ISLAND BRANCH, PITTSBURGH, PA.

BELMONT IRON WORKS
PHILADELPHIA

BELMONT IRON WORKS

PHILADELPHIA NEW YORK EDDYSTONE

Engineers · Contractors · Exporters

STRUCTURAL STEEL

Complete Industrial Buildings

PATTERSON BLOCKS

Builders of dependable tackle blocks since 1858.
There is one to suit each of your needs.

Write for Catalog No. 22

W. W. PATTERSON CO.
50 Water St., Pittsburgh, Pa.

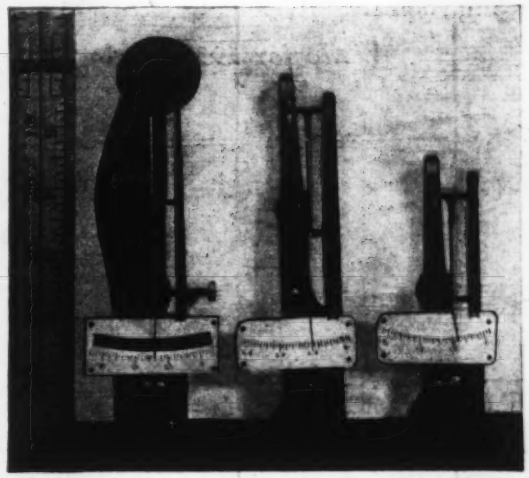
EARLE GEARS

Cut Spur, Bevel, Herringbone and Worm Gears

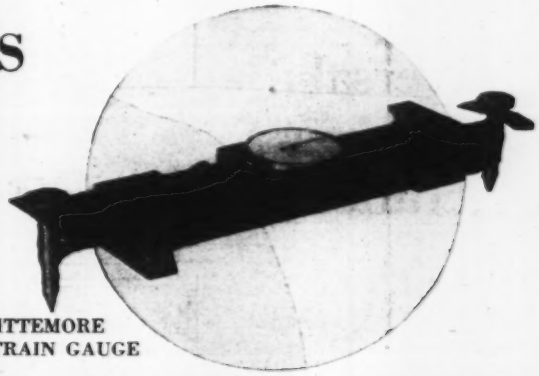
All sizes. Every description. Operating Machinery for Bridges, etc. "Lea Simplex" Cold Metal Saws.

The Earle Gear & Machine Co.
4717 Stenton Ave.
Philadelphia, Pa.
110 State St., Boston, Mass.
95 Liberty St., New York City

ACCURATE INDICATORS *of* STRESS & STRAIN



HUGGENBERGER TENSOMETER



WHITTEMORE STRAIN GAUGE

Stress and strain distribution . . . their loci and intensity . . . can be readily observed and evaluated by the use of either or both of these precision instruments.

Theoretical calculations are thus accurately checked against the behavior of the finished structure subjected to test loadings and under actual use.

Complete literature showing wide application of these and other precision measuring equipment sent upon request.

TEST EQUIPMENT DIVISION

SOUTHWARK FOUNDRY AND MACHINE CO.
PHILADELPHIA PA

DETROIT OFFICE
STEEL CITY TESTING LABORATORIES

CEMENT-GUN CONSTRUCTION CO.
GUNCRETE
For Placing Sand and Cement Mortar
16 YEARS OF EXPERIENCE WITH
GUNITE
Buy a Guncrete Gun to do your own work or get in touch with our Contracting Department.
337 S. Dearborn St. CHICAGO
Oliver Building PITTSBURGH
Grand Central Terminal NEW YORK

BERGER
TRANSITS AND LEVELS
BOSTON, 19, MASS., U.S.A.

Hamilton Steel Base Table

A new adjustable drawing table with many unique features. Base of steel, unbreakable. Top adjusts to any height or slant with ease. Cannot slip down. Made with large or small tops.

Very comfortable to work on, has large footrest.

Especially adaptable to vertical drafting.

Ask for Catalog 30-A

HAMILTON MFG. CO., Two Rivers, Wis.

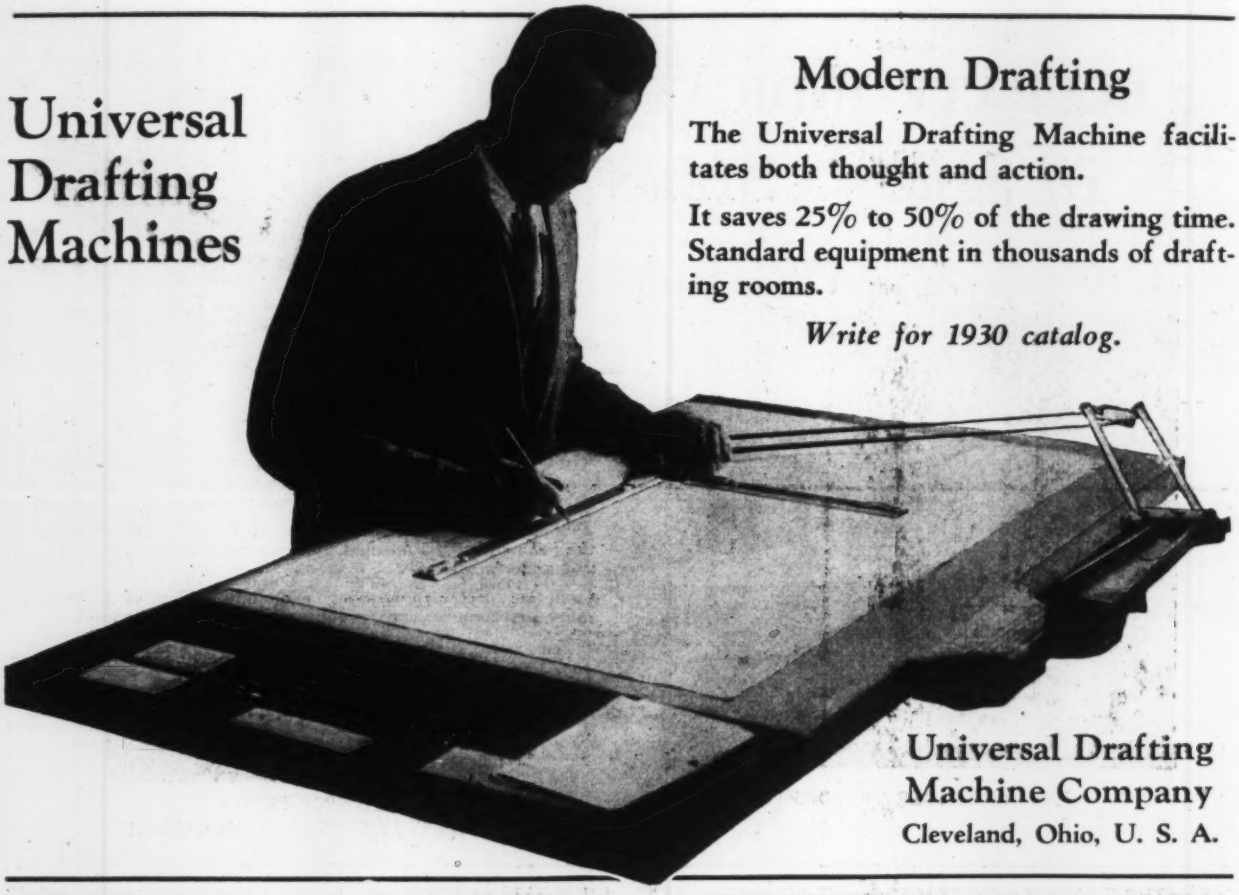
Master
Drawing Instruments

» » You can tell by the FEEL

Pick up a Weber-Riefler compass or divider . . . notice how comfortably it rests in your hand . . . how easily your fingers run down its smooth, round barrels . . . unmarred by set-screws . . . observe the perfect balance . . . here indeed are master drawing instruments for a master hand. Weber-Riefler Drawing Instruments are sold by leading engineering supply houses everywhere. F. Weber Co., Inc., 1220 Buttonwood St., Philadelphia. Branches: St. Louis and Baltimore.

Weber-Riefler
Drawing Instruments

Universal Drafting Machines



Modern Drafting

The Universal Drafting Machine facilitates both thought and action.

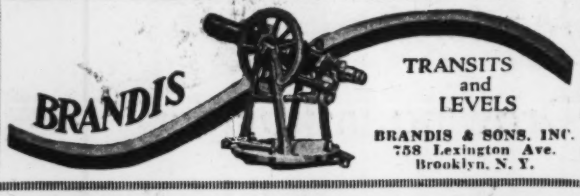
It saves 25% to 50% of the drawing time. Standard equipment in thousands of drafting rooms.

Write for 1930 catalog.

Universal Drafting Machine Company
Cleveland, Ohio, U. S. A.

ACCURACY and SIMPLICITY are the keynotes of the "BUFF" past record for so many years.

BUFF & BUFF MFG. CO.
Boston, Mass.
69 Dey St. N. Y. City
314 Institute Place Chicago 27



TRANSITS and LEVELS

BRANDIS & SONS, INC.
758 Lexington Ave.
Brooklyn, N. Y.

SINCE 1819 Kern Aarau

Famous for Quality and Modern Design

KERN DRAWING INSTRUMENTS
KERN SURVEYING INSTRUMENTS
KERN OPTICAL INSTRUMENTS

KERN COMPANY 136 Liberty Street NEW YORK, N. Y.

GURLEY

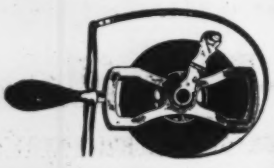
ENGINEERING INSTRUMENTS

MAIN OFFICE AND FACTORY TROY N.Y.
NEW YORK CITY SALES OFFICE 79 CHAMBERS STREET

DIETZGEN

DRAFTING AND SURVEYING SUPPLIES

CHICAGO SAN FRANCISCO WASHINGTON
NEW YORK PITTSBURGH LOS ANGELES
NEW ORLEANS PHILADELPHIA MILWAUKEE



FOR ACCURACY AND SERVICE BUY LUFKIN STEEL TAPES

Send for Catalog

THE LUFKIN RULE CO. Saginaw, Michigan

New York Windsor, Canada

Editorial Reprinted from Engineering News-Record, December 18, 1930

Next, Let Contracts

WITH the appropriation of more than a hundred million dollars for public-works acceleration a fundamentally important step toward unemployment relief and business reconstruction will have been taken. Alone, however, this one step is idle and valueless. It becomes effective only when the money is put to work. That is the next step.

The money is not meant to energize next summer's operations. Its big object is to make this a better winter, a winter when men will be working instead of idling. Every possible item of work that can be started now is wanted for this purpose. Contracts need to be let at once, not next spring. The eighty million dollar road loans to the states, the work on Boulder Canyon dam, the additional river and flood-control money, all these are operations to be put under way now. At best they can help only on a small scale; they cannot provide work for all who are now out of employment. The more reason for doing that little without delay, since what helps one will indirectly help many others.

Most or all of the work in question is such as would normally be let in spring. And because of this fact the agencies charged with utilizing the money will incline toward the usual procedure of planning, considering and preparing, with precaution and check and double-check. But this is not a normal occasion, and the money is not ordinary money. It is emergency money, for emergency times, and to use it effectively means emergency method and determination.

A contract in prospect is not a contract. It does not put orders on the books or call men back to the factories to make the supplies that must be ordered, or put men into the field. Road work that is to be let four months from now will not set in motion even preparatory operations, neither grading nor stockpiling nor even oiling up of equipment. It will have no value for the present or immediate future. It will leave the winter problem untouched.

Perhaps the business atmosphere in general will be made a little brighter with even such four-month prospect of contracts, now that the money is definitely in sight. It probably is true that public works can do very little in keeping the country's business alive. But that little, at least, should be done promptly, and no delays of leisureliness should be permitted to interfere with realizing all that it can contribute toward relief. If we must wait for reestablishment of a belief in business morals and in the soundness of banking and finance before private business activity is restored, let us not by procrastination delay the aid that emergency public-works construction can give.

These remarks address themselves to engineers and to administrative officials alike, but more especially to the former, the men of our own profession. Trained to faith in adequate preparation, they will see many obstacles to quick action, reason for requiring more time to draw plans, write careful specifications, and start with the season. But they are resourceful men, and can adapt their methods to emergency needs. Both in Washington and in the working regions of city and country, this is what the moment demands.

OFFICIAL PROPOSALS

OFFICIAL PROPOSALS

Bids: January 22, 1931.

West Side Sewage Treatment Works

Chicago, Ill.

Sealed proposals, endorsed "Proposals for West Side Sewage Treatment Works—Division Z" will be received by the Clerk of The Sanitary District of Chicago at the office of said Sanitary District, Room 600, Number 910 South Michigan Avenue, Chicago, Illinois, until 11 a.m., Standard Time, on Thursday, January 22, 1931, and will be opened publicly by the Board of Trustees of said Sanitary District at a meeting to be held on that day or at the first meeting thereafter.

The work for which tenders are invited is Division Z; Imhoff Tanks—Battery C.

The work consists of constructing a battery of 36 Imhoff tanks, each 80 feet square and 38.5 feet deep, with 3 operating galleries; 2 valve houses and 1 ejector house, each with a superstructure; a service tunnel, conduits, and the furnishing and installing of pipe and valve work, mechanical and electrical equipment, and other appurtenances. The major items of work are:

Excavation and grading.235,000 cubic yards
Concrete .....84,000 cubic yards
Reinforcement and miscellaneous steel .....11,262,000 pounds
Cast iron pipe and fittings..3,448,000 pounds

The West Side Sewage Treatment Works is located south of West Pershing Road and west of South Fifty-second Avenue, in the Village and Township of Stickney, Cook County, Illinois.

Proposals must be made on all the work complete, and not on any part thereof.

All bids must be made on blank forms of proposal furnished by the Sanitary District, and shall be made in accordance with and conform to all of the terms and conditions set forth in "Requirements for Bidding and Instructions to Bidders" attached thereto.

Specifications, form of proposal and a complete set of plans (approximately 100 drawings) may be obtained at said office of said Sanitary District upon payment of the sum of Twenty-five Dollars ($25.00) for each complete set, said sum so paid to become the property of the Sanitary District except where a bonafide bid is submitted on the work, in which case said payment will be refunded to the bidder.

Sets of plans and specifications will also be on file at said office, open for the inspection of prospective bidders who desire an opportunity to see the nature of the work before paying for plans. Persons requesting portions of the complete set of plans will be charged on a prorata basis.

Each proposal must be accompanied by a certified check on a responsible bank doing business in the City of Chicago, to the amount of Two Hundred and Fifty Thousand Dollars ($250,000.00) payable to the order of the Clerk of The Sanitary District of Chicago.

The Board of Trustees of The Sanitary District of Chicago reserves the right to reject any or all proposals.

THE SANITARY DISTRICT OF CHICAGO
By ROSS A. WOODHULL,
Chairman of Its Committee on Finance.
Attest: HARRY E. HOFF, Clerk.
Chicago, December 20, 1930.

Bids: January 6, 1931.

Highway Work

Richmond, Va.

Sealed bids will be opened Dept. of Highways, Richmond, Va., 10 a.m., Tuesday, Jan. 6th, 1931 Rt. 12 Proj. 566B1 63 ft. br. cu.yds. conc. 272, lbs. reinf. steel 8,330, struct. steel 57,000, lin.ft. piles 2,200. Rt. 12 Proj. 566B2 32 ft. 6 in. br. Cu.Yds. conc. 84, lbs. reinf. steel 13,195. Brunswick County. Details obtained upon request.

OFFICIAL PROPOSALS

Bids: January 13, 1931.

Track and Trestle

ATTICA PRISON

Attica, Wyoming County, New York.

Sealed proposals for constructing track and trestle at the Attica State Prison, Attica, Wyoming County, New York, will be received at the office of the Department of Correction, State Office Building, Albany, New York at 2 p.m., Eastern Standard Time, Tuesday, January 13, 1931, when they will be publicly opened and read. Proposals shall be endorsed on the envelope "Proposal for Constructing Track and Trestle, Attica State Prison, Wyoming County, New York" and addressed to the Department of Correction, State Office Building, Albany, N. Y., and shall be accompanied by a deposit consisting of a certified check drawn upon some legally incorporated bank in this State and made payable at sight to the State of New York, or money, for not less than five per cent (5%) of the amount of the proposal. The Contractor to whom award is made will be required to furnish for the faithful performance of the work a surety bond in amount of fifty per cent (50%) of the amount of the contract. The right is reserved to reject any and all bids. Specifications and plans for this contract may be examined at the office of the Department of Correction, State Office Building, Albany, N. Y.; at the office of the Chief Engineer, Department of Public Works, Division of Engineering, State Office Building, Albany, N. Y.; at the office of the District Engineer, Department of Public Works, Barge Canal Terminal, Rochester, N. Y.; and at the office of the District Engineer, Department of Public Works, Barge Canal Terminal, Buffalo, N. Y. Plans and specifications for this contract will be furnished by the Chief Engineer, Department of Public Works, Division of Engineering, upon payment of $1.05. No refund will be made for plans returned. The estimated cost of this project is $49,989.

DEPARTMENT OF CORRECTION,
WALTEER N. THAYER, JR.,
Commissioner

Bids: January 13, 1931.

Refrigeration Work

Spec. No. 6147

Attica, N. Y.

Sealed proposals covering Refrigeration Work for Dining, Kitchen and Bakery Building, Attica State Prison, Attica, N. Y., in accordance with Specification No. 6147 and accompanying drawings, will be received by The Commissioner, Department of Correction, 17th Floor, State Office Building, Albany, N. Y., until 3 o'clock (Eastern Standard Time) on Tuesday, January 13, 1931. Proposals shall be accompanied by a certified check or money deposit of 5% of the amount of the bid. Successful bidder will be required to give a bond in the sum of 50% of the amount of the contract. Drawings and specifications may be examined free of charge at the following offices:

Commissioner of Architecture, 80 Centre St., 8th Floor, State Office Building, New York City.
Commissioner of Architecture, 11th Floor, State Office Building, Albany, N. Y.
District Engineer, 109 N. Genesee St., Utica, N. Y.
District Engineer, Weighlock Building, Syracuse, N. Y.
District Engineer, Barge Canal Terminal, Rochester, N. Y.
District Engineer, Barge Canal Terminal, Buffalo, N. Y.
District Engineer, 71 Frederick St., Binghamton, N. Y.

Proposal blanks and envelopes may be obtained and drawings and specifications may be purchased from the Commissioner of Architecture, 11th Floor, State Office Building, Albany, N. Y., upon a payment of $2.50.

There will be no return of the money paid for such drawings and specifications.

Dated: December 11, 1930.

OFFICIAL PROPOSALS

Bids: January 14.

Electric Service Connections, Etc.

Spec. No. 5964

Queens, L. I.

Sealed proposals covering Electric Service Connections and Additional Power Plant Equipment, Brooklyn State Hospital, Creedmoor Division, Queens, Long Island, N. Y., in accordance with Specification No. 5964 and accompanying drawings will be received by the Commissioner of Mental Hygiene, 18th Floor, State Office Building, Albany, N. Y., until 3 o'clock (Eastern Standard Time) on Wednesday, January 14, 1931. Proposals shall be accompanied by a certified check or money deposit of 5% of the amount of the bid. Successful bidder will be required to give a bond in the sum of 50% of the amount of the contract. Drawings and specifications may be examined free of charge at the following offices:

Commissioner of Architecture, 80 Centre St., 8th Floor, State Office Building, New York City.
Commissioner of Architecture, 11th Floor, State Office Bldg., Albany, N. Y.
District Engineer, 109 N. Genesee St., Utica, N. Y.
District Engineer, Weighlock Building, Syracuse, N. Y.
District Engineer, Barge Canal Terminal, Rochester, N. Y.
District Engineer, Barge Canal Terminal, Buffalo, N. Y.
District Engineer, 71 Frederick St., Binghamton, N. Y.
Brooklyn State Hospital, Creedmoor Division, Queens, N. Y.

Proposal blanks and envelopes may be obtained and drawings and specifications may be purchased from the Commissioner of Architecture, 11th Floor, State Office Building, Albany, N. Y., upon a payment of $2.50 for each set of Electric drawings and specifications.

There will be no return of the money paid for such drawings and specifications.

Dated: December 8, 1930.

Bids: December 30.

Brook Enclosure

Boundbrook, N. J.

Sealed bids accompanied by certified check for $3,000 payable to the collector for the borough of Boundbrook, N. J. will be received at 8:00 p.m., Tuesday, December 30th, 1930, by the major and council of the borough of Boundbrook, N. J., for the construction of approximately 2,300 feet of pipe line sizes 30 in. to 60 in. in reinforced concrete pipe and 36 in. to 72 in. in corrugated iron pipe as an alternate. Plans and specifications, proposal forms and supporting papers may be obtained at the office of Fred S. Gould, Borough Engineer, Room 9, Morecraft Building, Hamilton St., Boundbrook, N. J., upon prepayment of $5.00. No refund will be made. The right is reserved to reject any or all bids by order of the borough council Fred S. Gould, Engineer.

Bids: January 23, 1931.

Excavation for Drainage

Birmingham, Ala.

Sealed proposals will be received by the undersigned until ten o'clock, a.m., Friday, January 23, 1931, for certain earth and rock excavation and rip-rap masonry which is proposed to be done by the City of Birmingham on Section Three of Village Creek drainage project, (from Avenue W, Ensley to 10th Street, West).

The approximate principal quantities being as follows: 149,200 Cu.Yds. Earth Excavation, 65,000 Cu.Yds. Rock Excavation and 700 Sq.Yds. Rip-Rap Masonry.

Specifications may be obtained and plans examined at this office. The right is reserved to reject any or all proposals.

A. J. HAWKINS, City Engineer.

OFFICIAL PROPOSALS

Bids: January 7, 1931.

Heating and Electric Work

Spec. Nos. 6206 and 6224

Kings Park, L. I.

Separate sealed proposal covering Heating and Electric Work for Service Connections, New Buildings, Kings Park State Hospital, Kings Park, L. I., N. Y., in accordance with Specifications Nos. 6206 and 6224 and accompanying drawings, will be received by the Commissioner, Department of Mental Hygiene, 18th Floor, State Office Building, Albany, N. Y., until 3 o'clock (Eastern Standard Time) on Wednesday, January 7, 1931. Proposals shall be accompanied by a certified check or money deposit of 5 per cent of the amount of the bid. Successful bidders will be required to give a bond in the sum of 50 per cent of the amount of the contract. Drawings and specifications may be examined free of charge at the following offices:

Commissioner of Architecture, 80 Center St., 8th Floor, State Office Building, New York City.

Commissioner of Architecture, 11th Floor, State Office Building, Albany, N. Y.

District Engineer, 109 N. Genesee St., Utica, N. Y.

District Engineer, Weighlock Building, Syracuse, N. Y.

District Engineer, Barge Canal Terminal, Rochester, N. Y.

District Engineer, Barge Canal Terminal, Buffalo, N. Y.

District Engineer, 71 Frederick St., Binghamton, N. Y.

Kings Park State Hospital, Kings Park, L. I., N. Y.

Proposal blanks and envelopes may be obtained and drawings and specifications may be purchased from the Commissioner of Architecture, 11th Floor, State Office Building, Albany, N. Y., upon a payment of $5.00 for each set of Heating plans and specifications, and $2.50 for each set of Electric plans and specifications.

There will be no return of the money paid for such drawings and specifications.

Dated: December 4, 1930.

Bids: December 30.

Heating Work

Beacon, N. Y.

Sealed proposals covering heating work, Central Power Plant (silicon carbide block and brick courses for boiler settings and circulating oiling systems and synchronizing equipment for generator engines) Matteawan State Hospital, Beacon, N. Y., in accordance with Specification No. 6166 and accompanying drawing, will be received by the Commissioner, Department of Correction, 17th floor, State Office Building, Albany, N. Y., until 3 o'clock (Eastern Standard Time) on Tuesday, December 30, 1930. Proposals shall be accompanied by a certified check or money deposit of 5% of the amount of the bid. Successful bidder will be required to give a bond in the sum of 50% of the amount of the contract. Drawings and specifications may be examined free of charge at the following offices:

Commissioner of Architecture, 80 Centre St., 8th floor, State Office Building, New York City.

Commissioner of Architecture, 11th floor, State Office Building, Albany, N. Y.

District Engineer, 109 N. Genesee St., Utica, N. Y.

District Engineer, Weighlock Building, Syracuse, N. Y.

District Engineer, Barge Canal Terminal, Rochester, N. Y.

District Engineer, Barge Canal Terminal, Buffalo, N. Y.

District Engineer, 71 Frederick St., Binghamton, N. Y.

Matteawan State Hospital, Beacon, N. Y.

Proposal blanks and envelopes may be obtained and drawings and specifications may be purchased from the Commissioner of Architecture, 11th floor, State Office Building, Albany, N. Y., upon a payment of $2.50.

There will be no return of the money paid for such drawings and specifications.

Dated: December 4, 1930.

OFFICIAL PROPOSALS

Bids: January 5, 1931.

Construction of Bridge

STATE OF NEW JERSEY
STATE HIGHWAY COMMISSION

Trenton, N. J.

NOTICE IS HEREBY GIVEN that sealed bids will be received by the State Highway Commission of New Jersey for:

Construction of a bridge on Route 6, Section 3, across Route S-1, in Palisades Park, Bergen County. The bridge will consist of deck plate girders, spanning 58 ft. with a roadway width of 60 ft. and two 10 ft. sidewalks. The principal items of construction are:

Estimated:

2,000 cu.yds. Concrete.
77,600 lbs. reinforcing steel.
145,300 lbs. structural steel.

Bids for the above will be received at the office of the New Jersey State Highway Commission, State House Annex, Trenton, New Jersey, on Monday, January 5th, 1931, at twelve o'clock Noon, Eastern Standard Time, and will be opened and read immediately thereafter.

Drawings, specifications and form of bid, contract and bond for the proposed work are on file at the office of the State Highway Department, Trenton, N. J., and may be inspected by prospective bidders during office hours. Plans will be furnished on a deposit of Ten Dollars ($10.00) upon application to the State Highway Department, Room 102, State House Annex, Trenton, N. J. Bids must be made on the standard proposal forms in the manner designated in the 1926 standard specifications for State bridges and must be enclosed in sealed special addressed envelopes bearing the name and address of the bidder and work bid upon on the outside, and must be accompanied by a certified check drawn to the order of the Treasurer of the State of New Jersey for not less than ten per cent (10%) of the amount of the bid, provided that the said certified check shall not be less than $500.00 nor more than $20,000.00 and must be delivered at the above place on or before the hour named. Copies of the standard proposal form and special addressed envelopes will be furnished on application. Bids not enclosed in special addressed envelopes will be considered informal and will not be opened.

Each bidder must also accompany his bid with a Statement of Equipment properly filled out.

By order of the State Highway Commission.

A. LEE GROVER,
Chief Clerk.

An Instant Source of Man Power

Big enough to meet any schedule.

Beacon Commissaries are prepared to contract for the recruiting, feeding and housing of men anywhere thruout the United States.

Beacon Commissary Corp.
22 South Street
New York City

OFFICIAL PROPOSALS

Bids: January 6, 1931.

Bridges

Baton Rouge, La.

Sealed proposals for the construction of the following projects will be received by the Louisiana Highway Commission, Room No. 614, Louisiana National Bank Building, Baton Rouge, Louisiana, until 9:45 o'clock a.m. on Tuesday, Jan. 6, 1931. Proposals will not be received after this hour. At 10:00 o'clock a.m. of the same day and date, they will be publicly opened and read in the Senate Chamber, in the State Capitol Building.

(BOND) F. A. PROJECT NO. 190-B-2, BOEUF RIVER BRIDGE AND SIX OTHER BRIDGES ON THE OAK GROVE-MER ROUGE HIGHWAY, Located in West Carroll and Morehouse Parishes, Route No. 11.

DESCRIPTION: 1—160 ft. Fixed Span; reinforced concrete piers on timber piles, 1,350 ft. combined steel-concrete-timber trestle spans. Charge for plans $2.50.

PROJECT NO. 463-B, TANGIPAHOA RIVER BRIDGE, KENTWOOD—SUNNY HILL HIGHWAY, Located in Tangipahoa Parish, Route No. 71.

DESCRIPTION: 2—40 ft. "I" Beam Spans; 22 Creosoted pile trestle spans; Earth Approaches. Charge for plans $1.00.

(BOND) F. A. PROJECT NO. 1402, RED RIVER BRIDGE, ARCHIE-MARKSVILLE HIGHWAY, Located in Avoyelles Parish, Route No. 57.

DESCRIPTION: 1—320 ft. Swing Span; 1—320 ft. Fixed Span; 1—100 ft. Fixed Span; reinforced Concrete piers on timber piles; 14-31 ft. reinforced concrete deck girder spans on concrete piles; Earth approaches. Charge for plans $3.00.

(BOND) PROJECT NO. 2600, AMITE RIVER BRIDGE, BATON ROUGE-HAMMOND HIGHWAY, Located in East Baton Rouge and Livingston Parishes, Route No. 7.

DESCRIPTION: 1—250 ft. Fixed Span; Reinforced concrete Piers on timber piles; 38—30 ft. reinforced concrete deck girder spans on concrete piles. Charge for plans $2.50.

(BOND) F. A. PROJECT NO. 5004, RED RIVER BRIDGE, COUSHATTA-MANSFIELD HIGHWAY, Located in Red River Parish, Route No. 9.

DESCRIPTION: 1—320 ft. Swing Span; 4—250 ft. Fixed Spans; 1—140 ft. Fixed Span; reinforced concrete piers; 8—31 ft. Reinforced concrete deck girder spans on concrete piles; earth approaches. Charge for plans $3.00.

(BOND) PROJECT NO. 6104, BOGUE CHITTO RIVER BRIDGE, COVINGTON-BOGALUSA HIGHWAY, Located in St. Tammany Parish, Route No. 7.

DESCRIPTION: 1—160 ft. Fixed Span; reinforced concrete piers on timber piles; 90—20 ft. Combination steel-concrete-timber spans. Charge for plans, $2.00.

Full information and proposal forms are available at the offices of the Highway Commission at Baton Rouge. Plans and Specifications may be inspected there or will be furnished upon payment of amounts specified above (not to be refunded).

HARRY B. HENDERLITE
State Highway Engineer.
O. K. ALLEN, Chairman
LOUISIANA HIGHWAY COMMISSION.

Bids: December 30.

Extension to Drainage Pumping Station

New Orleans, October 9, 1930.

Sealed proposals will be received by the Sewerage and Water Board of New Orleans, at the office of the Secretary, Room 401, No. 526 Carondelet Street, up to 12 o'clock noon (Central Standard Time) of Tuesday, December 30, 1930, for Contract 118-D, Extension to Drainage Pumping Station No. 7. Plans and specifications may be obtained at the office of the Board. A deposit of $100 will be required to guarantee return of each set of plans issued. The right is reserved to reject any or all bids.

GEO. G. EARL, Gen'l. Supt.
A. G. MOFFAT, Secretary.

OFFICIAL PROPOSALS

Bids: January 6, 1931.

Paving

Baton Rouge, La.

Sealed proposals for the construction of the following projects will be received by the Louisiana Highway Commission, Room No. 614, Louisiana National Bank Building, Baton Rouge, Louisiana, until 9:45 o'clock a.m. on Tuesday, January 6th, 1931. Proposals will not be received after this hour. At 10:00 o'clock a.m. of the same day and date, they will be publicly opened and read in the Chamber of House of Representative in the State Capitol Building.

(BOND) PROJECT NO. 738-A, TROUT-TULLOS Highway Located in LaSalle Parish, Routes 108 and 474, Length 11.1 miles, width 18 ft. Type Portland Cement Concrete Pavement and other work in connection therewith. Charge for plans $2.50.

(BOND) PROJECT NO. 1100, OBERLIN-OAKDALE Highway Located in Allen Parish, Route 24, Length 14.0 miles, width 18 ft. Type Portland Cement Concrete Pavement and other work in connection therewith. Charge for plans $2.50.

(BOND) PROJECT NO. 1403, MARKSVILLE-RAPIDES PARISH LINE HWY. Located in Avoyelles Parish, Routes 5 and 57, Length 14.9 miles, width 18 ft. Type Portland Cement Concrete Pavement and other work in connection therewith. Charge for plans $2.50.

(BOND) PROJECT NO. 2300, HOMER HAYNESVILLE Highway Located in Claiborne Parish, Route 12, Length 12.7 miles, width 18 ft. Type Portland Cement Concrete Pavement and other work in connection therewith. Carge for plans $2.50.

(BOND) PROJECT NO. 2951, VILLE PLATTE-REDDELL HWY. Located in Evangeline Parish, Route 22, Length 7.3 miles, width 18 ft. Type Portland Cement Concrete Pavement and other work in connection therewith. Charge for plans $2.00.

(BOND) PROJECT NO. 3250, ST. MARTINVILLE-NEW IBERIA HWY. Located in St. Martin and Iberia Parishes, Route 25, Length 11.0 miles, width 18 ft. Type Portland Cement Concrete Pavement and other work in connection therewith. Charge for plans $2.50.

(BOND) PROJECT NO. 3451, HODGE-QUITMAN Highway Located in Jackson Parish, Route 5, Length 6.8 miles, width 18 ft. Type Portland Cement Concrete Pavement and other work in connection therewith. Charge for plans $2.00.

(BOND) PROJECT NO 3852, THIBODAUX-RACELAND Highway Located in Lafourche Parish, Route 29, Length 8.1 miles, width 18 ft. Type Portland Cement Concrete Pavement and other work in connection therewith. Charge for plans $2.00.

(BOND) PROJECT NO. 4152, AMITE RIVER-DENHAM SPRINGS Highway Located in Livingston Parish, Route 7, Length 3.1 miles, width 18 ft. Type Portland Concrete Pavement and other work in connection therewith. Charge for plans $1.50.

(BOND) PROJECT NO. 4300 BASTROP-MONROE Highway Located in Morehouse & Quachita Parishes, Routes 11 and 200, Length 10.8 miles, width 18 ft. Type Portland Cement Concrete Pavement and other work in connection therewith. Charge for plans $2.50.

(BOND) PROJECT NO. 4605, MONROE-BASTROP Highway Located in Ouachita Parish, Route 200, Length 11.6 miles, width 18 ft. Type Portland Cement Concrete Pavement and other work in connection therewith. Charge for plans $2.50.

(BOND) PROJECT NO. 5300, PACKENHAM-ST. BERNARD HIGHWAY Located in St. Bernard Parish, Routes 32 and 1, Length 8.7 miles, width 18 ft. Type Portland Cement Concrete Pavement and other work in connection therewith. Charge for plans $2.00.

(BOND) PROJECT NO. 6203, AMITE-TANGIPAHOA Highway Located in Tangipahoa Parish, Route 33, Length 10.4 miles, width 18 ft. Type Portland Cement Concrete Pavement and other work in connection therewith. Charge for plans $2.50.

(BOND) PROJECT NO. 6501, ROUTES 11 and 15 THROUGH FARMERVILLE Highway Located in Union Parish, Routes 11 and 15, Length 8.7 miles, width 18 ft. Type Portland Cement Concrete Pavement and other work in connection therewith. Charge for plans $2.00.

(BOND) PROJECT NO. 6601, KAPLAN-ABBEVILLE HIGHWAY Located in Vermillion Parish, Route 25, Length 11.6 miles, width 18 ft. Type Portland Cement Concrete Pavement and other work in connection therewith. Charge for plans $2.50.

OFFICIAL PROPOSALS

(BOND) PROJECT NO. 7000, PORT ALLEN-LIVONIA Highway Located in West Baton Rouge and Pointe Coupe Parishes, Route 1, Length 20.3 miles, width 20 ft. Type Portland Cement Concrete Pavement and other work in connection therewith. Charge for plans $3.50.

(BOND) PROJECT NO. 7301, JONESBORO-TANNEHILL Highway Located in Winn-Jackson Parishes, Route 5, Length 17.0 miles, width 18 ft. Type Portland Cement Concrete Pavement and other work in connection therewith. Charge for plans $3.00.

Full information and proposal forms are available at the offices of the Highway Commission at Baton Rouge. Plans and Specifications may be inspected there or will be furnished upon payment of (amount specified above) not to be refunded.

HARRY B. HENDERLITE,
State Highway Engineer.
O. K. ALLEN, Chairman,
LOUISIANA HIGHWAY COMMISSION

Bids: January 13, 1931.

Sewers and Water Lines

ATTICA STATE PRISON
Attica, Wyoming County, N. Y.

Sealed proposals for constructing sewers and water lines at Attica State Prison, Attica, Wyoming County, New York, will be received at the office of the Department of Correction, State Office Building, Albany, New York at 2 p.m., Eastern Standard Time, Tuesday, January 13, 1931, when they will be publicly opened and read. Proposals shall be endorsed on the envelope, "Proposal for Constructing Sewers and Water Lines at Attica State Prison, Attica, Wyoming County, New York," and addressed to the Department of Correction, State Office Building, Albany, N. Y., and shall be accompanied by a deposit consisting of a certified check drawn upon some legally incorporated bank in this State and made payable at sight to the State of New York, or money, for not less than five per cent (5%) of the amount of the proposal. The contractor to whom award is made will be required to furnish for the faithful performance of the work a surety bond in amount of fifty per cent (50%) of the amount of the contract. The right is reserved to reject any and all bids. Plans and specification for this contract may be examined at the office of the Department of Correction, State Office Building, Albany, N. Y.; at the office of the Chief Engineer, Department of Public Works, Division of Engineering, State Office Building, Albany, N. Y., and at the office of the District Engineer, Department of Public Works, Barge Canal Terminal, Rochester, N. Y. Plans and specifications for this contract will be available on or about December 20th, 1930, and will be furnished by the Chief Engineer, Department of Public Works, Division of Engineering, upon payment of $4.20. No refund will be made for plans returned. The estimated cost of this project is $195,-111.00.

DEPARTMENT OF CORRECTION,
WALTER N. THAYER, JR.,
Commissioner.

Bids: February 4, 1931.

Furnishing Materials for Drainage Stations

New Orleans, La.

December 5, 1930.

Separate sealed proposals will be received by the Sewerage & Water Board of New Orleans, at the office of the Secretary, Room 401, No. 526 Carondelet Street, New Orleans, up to twelve o'clock noon (Central Standard Time), of Wednesday, February 4, 1931, for the following: Cont. 119-D, Motors and Accessories for Vertical Trash Pump, Drainage Stns. Nos. 6 and 7; Cont. 208-S, Vertical Trash Pumps and Cast Iron Pipe and Fittings for Drainage Stns. Nos. 2, 6 and 7; Cont. 209-S, Valves for Vertical Trash Pumps, Drainage Stns. Nos. 2, 6 and 7; Cont. 210-S, Alterations to drainage Stns. Nos. 2 and 6. Plans and Specifications may be obtained at the office of the Board. A deposit of $50.00 will be required for each set of Plans issued on Contracts 208-S, 119-D and 210-S. No deposit for Plans will be required on 209-S. The right is reserved to reject any or all bids.

A. G. MOFFAT, Secretary.
GEO. G. EARL, Gen'l Supt.

SPECIAL SERVICES
TO CONTRACTORS

We Contract for Watertight Cellars and Pits

Preservation of Exterior Concrete and Masonry Surfaces.

Sprayed Exterior Painting.

Results Guaranteed and Bonded.

What is your problem?

STRUCTURAL WATERPROOFING CO., Inc.
Water & Dampproofing Contractors
287 Madison Ave., N. Y. C.
or
1528 Walnut St., Philadelphia, Pa.

We Cut Steel Under Water

Using only ordinary oxygen, hydrogen and compressed air. Complete outfits and skilled operators available for any thickness or depth anywhere.

Craftsweld Equipment Corporation
250 W. 54th St., New York

CUT ANY METAL UNDER WATER

Complete Apparatus, Skilled Divers, cut any metal at any diveable depth. 24 hour service.

Merritt-Chapman & Scott Corporation
17 Battery Place, New York City

OFFICIAL PROPOSALS

Bids: January 9, 1931.

Westchester County Trunk Sewer

SEALED BIDS accompanied by certified check for $20,000, subject to being cashed, will be received up to 2:00 p.m., Friday, January 9, 1931, in the Supervisors Chambers, Court House, White Plains, N. Y., for the watertight and enduring

CONSTRUCTION in 60 to 120 calendar days of Section G Blind Brook project comprising between 900 and 1,400 feet of 18" Cast Iron trunk sewer with all appurtenances; principally located in the Village of Rye.

PLANS AND SPECIFICATIONS, Invitation to Contractors, forms for Bids, Contract and Bond may be obtained after December 23 at the Commission's office, also at room 1607, No. 90 West Street, New York City, upon the deposit of $20.00.

WESTCHESTER COUNTY SANITARY SEWER COMMISSION
EUGENE S. MARTIN, Secretary.

Court House Annex, White Plains,
December 1, 1930. Phone 7780.

OFFICIAL PROPOSALS

Bids: January 7, 1931.

Heating Work

Spec. 6205

Ogdensburg, N. Y.

Sealed proposals covering Heating Work, Additional Boiler Capacity and Equipment, St. Lawrence State Hospital, Ogdensburg, N. Y., in accordance with Specification No. 6205 and accompanying drawings, will be received by the Commissioner, Department of Mental Hygiene, 18th Floor, State Office Building, Albany, N. Y., until 3 o'clock (Eastern Standard Time) on Wednesday, January 7, 1931. Proposals shall be accompanied by a certified check or money deposit of 5 per cent of the amount of the bid. Successful bidder will be required to give a bond in the sum of 50 per cent of the amount of the contract. Drawings and specifications may be examined free of charge at the following offices:

Commissioner of Architecture, 80 Center St., 8th Floor, State Office Building, New York City.

Commissioner of Architecture, 11th Floor, State Office Building, Albany, N. Y.

District Engineer, 109 N. Genesee St., Utica, N. Y.

District Engineer, Weighlock Building, Syracuse, N. Y.

District Engineer, Barge Canal Terminal, Rochester, N. Y.

District Engineer, Barge Canal Terminal, Buffalo, N. Y.

District Engineer, 71 Frederick St., Binghamton, N. Y.

St. Lawrence State Hospital, Ogdensburg, N. Y.

Proposal blanks and envelopes may be obtained and drawings and specifications may be purchased from the Commissioner of Architecture, 11th Floor State Office Building, Albany, N. Y., upon a payment of $5.00.

There will be no return of the money paid for such drawings and specifications. Dated: December 4, 1930.

Bids: January 8.

Furnishing Cast Iron Pipe

Hammonton, N. J.

Sealed proposals for furnishing approximately 9,541 feet of 8 inch, and 4,792 feet of 6 inch cast iron pipe, and the necessary appurtenances, in and for the Town of Hammonton, will be received by the Board of Water Commissioners, at their office in the Water Works, Hammonton, N. J., on January 8th, 1931, until 8:00 p.m. Eastern Standard Time.

Plans, blank forms of proposals, specifications and all other information may be obtained at the office of Joseph A. Baker, Town Engineer, at Hammonton, N. J., on deposit of $10.00-$5.00 of which will be refunded on return of plans and specifications in good condition.

The right is reserved to reject any or all bids and to waive informalities.

By Order of the Board of Water Commissioners.

MRS. MILDRED E. WILSON, Sec.

U. S. Government

WAR DEPARTMENT, Office Constructing Quartermaster, Randolph Field, Texas.—Sealed proposals will be received in this office until 2 p.m., January 16, 1931, and then opened, for the construction of one Electric Substation and Gas Meter House, at Randolph Field, Texas. $25.00 required for plans and specifications. (265)

U. S. Government

PROPOSALS FOR BARRACK BUILDINGS.—Office of Constructing Quartermaster, Fort Monroe, Va.—Sealed proposals will be received here until 11 a.m., January 15, 1931, and then opened, for construction of One 163-men Barracks; Two 200-men Barracks; and one 300-men Barracks at Langley Field, Va. Twenty-five Dollar deposit check for plans and specifications. Further information on application. (257)

WAR DEPARTMENT—Office Constructing Quartermaster, Randolph Field, Texas—Sealed proposals will be received in this office until 2 p.m., January 5, 1931, for the construction of One Black Powder Magazine and One Combined Primer and Fuse Magazine at Randolph Field, Texas. $10.00 required for plans and specifications. (255)

U. S. ENGINEER OFFICE, Jacksonville, Fla.—Sealed bids, in duplicate, will be received here until 12 noon, December 29, 1930, and then opened, for furnishing all labor, materials, equipment and accessories and performing all work for core drilling in Lake Okeechobee, Fla. Further information on application. (2510)

U. S. ENGINEER OFFICE, Milwaukee, Wis. Sealed bids will be received until 3 p.m., January 16, 1931, and then publicly opened, for constructing 4 steel, diesel-driven tugs. (259)

UNITED STATES DEPARTMENT OF THE INTERIOR, Bureau of Reclamation, Washington, D. C., December 15, 1930. Sealed bids (Specification No 519) will be received at the office of the Bureau of Reclamation, Wilda Building, 1441 Welton Street, Denver, Colorado, until 10 o'clock a.m., March 4, 1931, and then publicly opened, for furnishing labor and materials and performing all work for the construction of the Hoover Dam, power plant and appurtenant works, Boulder Canyon project, Arizona-Nevada-California. The work is located on the Colorado River at the Black Canyon dam site, approximately 30 miles southeast of Las Vegas, Nevada, which city is on the main line of the Los Angeles & Salt Lake (Union Pacific) Railroad. The work includes the 730-foot dam, four 50-foot diameter diversion tunnels, cofferdams, power plant (not including installation of machinery), spillways and outlet works. The principal items and the estimated quantities involved are as follows: 1,800,000 cubic yards of all classes of open cut excavation; 1,900,000 cubic yards of tunnel and shaft excavation; 1,200,000 cubic yards of earth and rock fill in cofferdams and river channel protection; 4,400,000 cubic yards of concrete; 228,000 cubic feet of grout; drilling 190,000 linear feet of grout and drainage holes; placing 5,500,000 pounds of reinforcement bars; installing 1,900,000 pounds of small metal pipe and fittings; installing 32,500,000 pounds of large metal conduits; installing 10,600,000 pounds of structural steel; installing 20,000,000 pounds of gates, hoists and other metal work. This invitation for bids does not cover the purchase of materials which are to be furnished by the Government. Materials to be furnished by the contractor and those furnished by the Government are described in the specifications which will be a part of the contract. For particulars, address the Bureau of Reclamation, Las Vegas, Nevada; Denver, Colorado; or Washington, D. C. Specifications and plans may be obtained from any of these offices for $5.00, and remittance should be made payable to "Bureau of Reclamation." ELWOOD MEAD, Commissioner. (261)

U. S. Government

SEALED BIDS, in triplicate, subject to the conditions contained herein, will be received by the U. S. Veterans Bureau, Room 764, Arlington Building, Washington, D. C., until 2:30 p.m., January 20, 1931, and then publicly opened for furnishing all labor and materials and performing all work required for constructing and finishing complete at U. S. Veterans Hospital, Indianapolis, Indiana, buildings and utilities, including roads, walks, grading and drainage. This work will include excavating, reinforced concrete construction, hollow tile, brick work, cut stone, cast stone, marble work, floor and wall tile, rubber tile, compressed asphalt tile and linoleum floors, terrazzo, iron work, flag pole, steel sash, steel stairs with slate treads, steel shelving, cabinets and partitions, slate, metal and built-up roofing, roof ventilators, lightning conductors, metal lathing, plastering, carpentry, dumbwaiter, platform scale, metal weather strips, insect screens, window shades, painting, glazing, hardware, plumbing, vacuum cleaning system, refrigerating and ice making plant, zeolite water softening system, boiler plant, radial brick chimney, heating and ventilating, electrical work, electric elevators, nurses' call system, fire alarm system and outside sewer, water, gas, steam and electric distribution systems. Separate bids will be received for (a) General construction (including plumbing, heating, electrical work and outside distribution systems); (b) Electric elevators; (c) Zeolite water softening system; (d) Refrigerating and ice making plant; (e) Radial brick chimney; all as set forth on bid form. Bids will be considered only from individuals, firms or corporations possessing satisfactory financial and technical ability, equipment and organization to insure speedy completion of the contract and in making awards, the records of bidders for expedition and satisfactory performance on contracts of similar character and magnitude will be carefully considered. At the discretion of the director, drawings and specifications may be obtained upon application to the Construction Division, Room 764, Arlington Building, Washington, D. C. Deposit with application of a check or Postal Money Order for $40.00 payable to the Treasurer of the United States is required as security for safe return of the drawings and specifications within ten days after date of opening bids. GEORGE E. IJAMS, Director. December 15, 1930. (253)

PROPOSALS for Paint, Oil and Dope House and Parachute Building.—Office of Constructing Quartermaster, Fort Monroe, Va.—Sealed proposals will be received here until 11 a.m., January 20, 1931, and then opened, for construction of One Paint, Oil and Dope House and One Parachute Building at Langley Field, Va. Twenty-five Dollar deposit check required for plans and specifications. Further information on application. (263)

OFFICE OF THE CONSTRUCTING QUARTERMASTER, Maxwell Field, Montgomery, Alabama. Sealed proposals will be received here until 10:00 a.m., C.S.T., January 16, 1931, and then opened for the construction of Paint, Oil and Dope Warehouse, Maintenance Shop, Warehouse, and Garage at Maxwell Field, Alabama. Plans and specifications may be obtained from this office by deposit of $25.00. (262)

PROPOSALS FOR SEAWALL AND EMBANKMENT, Office of Constructing Quartermaster, Fort Monroe, Va.—Sealed proposals will be received here until 11 a.m., January 2, 1931, and then opened, for construction of a Seawall and Embankment at Langley Field, Va. Further information on application. (242)

U. S. ENGINEER OFFICE, Milwaukee, Wis.—Sealed bids will be received until 3 p.m., January 7, 1931, and then publicly opened, for rebuilding 758 linear feet of the south breakwater at Milwaukee, Wis. (244)

WAR DEPARTMENT—Office Constructing Quartermaster, Randolph Field, Texas—Sealed proposals will be received in this office until 2 p.m., January 15, 1931, and then opened, for the construction of seventeen Two-Story Company Officers Quarters, at Randolph Field, Texas. $25.00 required for plans and specifications. (264)

IT is a pleasure to extend to our Old and many New friends our best wishes for a Merry Christmas and a Successful New Year.

HARMON V. SWART

60 Park Pl. Newark, N. J. — ASSOCIATES, INC. — 80 William St. N. Y. City

EMPLOYMENT

AND OTHER BUSINESS OPPORTUNITIES

Positions Wanted, 5 cents a word, minimum charge $1.00 an insertion.
Positions Vacant and all other classifications, 10 cents a word, minimum $2.

Box Numbers in care of our New York, Chicago or San Francisco offices count as 10 words in addition to advertising copy.

Replies are forwarded each day as received at each of the offices mentioned without additional charge.

Discount of 10% is allowed if full payment is made in advance for 4 consecutive insertions.

THE ABOVE RATES ARE FOR ADVERTISEMENS SET UNDISPLAYED. FOR DISPLAY RATES SEE "USED EQUIPMENT" HEADING.
COPY FOR NEW ADVERTISEMENTS RECEIVED UNTIL 10 A.M. TUESDAY FOR THURSDAY'S ISSUE. E.N.-R.

POSITIONS VACANT

WANTED for the Panama Canal. Structural engineer and a mechanical engineer, entrance salary $395.83 a month each, required about January 15, 1931. Applicants must have thorough training and experience and only qualified men should apply. Must be American citizens (final papers) not over 45 years, in good health. Free steamship transportation from New York or New Orleans, salary beginning date of sailing. For further particulars write Chief of Office, The Panama Canal, Washington, D. C.

WANTED for the Panama Canal. Associate architect experienced in hydro-electric power plant design, technical graduate preferred. Entrance salary $333.33 a month. Applicants must be American citizens (final papers) not over 45 years, in good health. Free steamship transportation from New York or New Orleans, salary beginning date of sailing. For further particulars write "Chief of Office, The Panama Canal, Washington, D. C."

EXPERIENCED man to assist in sales and management of plant in Ohio engaged in fabricating and erecting steel plate and specializing in tanks, stacks and piping, riveted and welded. Selling experience required with preference to a man familiar with middle states territory. Give age, experience, references and salary expected. P-893, Engineering News-Record, 520 No. Michigan Ave., Chicago, Ill.

EMPLOYMENT SERVICE

CONSTRUCTION managers, superintendents, sales managers, sales engineers, auditors, comptrollers, treasurers in and out of construction have for 12 years engaged us. Individual. Confidential. Not employment agency. Jacob Penn, Incorporated, 535 Fifth Avenue, New York. Established 1919.

IF YOU are qualified for position between $2,500 and $25,000 and are receptive to negotiations for new connection, your response to this announcement is invited. The undersigned provides a thoroughly organized service, established twenty-one years ago, to conduct confidential preliminaries, and assist the qualified man in locating the particular position he desires. Not a registration bureau. Retaining fee protected by refund provision, as stipulated in our agreement. Send name and address only for description of service. R. W. Bixby, Inc., 272 Main Street, Buffalo, New York.

POSITIONS WANTED

Civil Engineers

CIVIL engineer, five years' experience as estimator for general contractor, desires to represent manufacturer in Philadelphia. PW-842, Engineering News-Record, Tenth Ave. at 36th St., New York.

CIVIL engineer, registered, 22 years experience railroad, water, gas and electric utilities; construction, design, investigations, valuations, operations, rates, expert testimony. Available December 15. PW-859, Engineering News-Record, Tenth Ave. at 36th St. New York.

CIVIL engineer, M.I.T. graduate, nine years steel and concrete design, estimating, planning, field, industrial buildings. PW-881, Engineering News-Record, Tenth Ave. at 36th St., New York.

TO HELP YOU

LOCATE COMPETENT MEN

"Searchlight" Advertising

Positions Vacant

Old and Well Established Firm

WANTS

BIN AND WEIGH BATCHER DESIGNER

Must have broad experience in modern methods of designing bins for aggregates and comprehensive knowledge of weighing batchers.

State age—experience—and be prepared to submit samples of work done—state salary expected—position permanent for right party.

P-854, Engineering News-Record, 520 No. Michigan Ave., Chicago, Ill.

ASPHALT ENGINEER
FOR INDIA

Single, not over 32 years of age, must have civil engineering background, preference being given to a degree from a recognized engineering school. Applicant must have recent experience in laying all kinds of asphalt roads as well as thorough plant training and some sales experience.

P-853, Engineering News-Record
Tenth Ave. at 36th St., New York City.

ENGINEERS

Manufacturer desires to get in touch with Engineers who would figure material requirements, from plans, for highway and bridge construction as such work materializes in or near their locality.

P-718, Engineering News-Record
520 No. Michigan Ave., Chicago, Ill.

MANAGER WANTED

A long-established House in the Middle West selling Transits, Levels, Blue Printing and a full line of supplies to Engineers, Surveyors, Mining Companies, Architects, etc., wants a man to take charge of the Engineering Department. Must be capable of purchasing, sales promotion and have the ability to "feel the pulse" of the engineering field. State qualifications, also salary wanted, in first letter. An interview will follow.

P-871, Engineering News-Record, 520 No. Michigan Ave., Chicago, Ill.

Success Can Be Attained By Any Ambitious Man

OTHER WILSON COURSES:
Reinforced Concrete Engineering
Structural Drafting
Structural Steel Designing
Structural Engineering
Bridge Engineering

The road to success in the biggest and best paid engineering specialty, is open to men who have only a grammar-school education. This is made possible by our

Preparatory Course
for
Structural Engineering
(Home Study, By Mail)

Structural work employs more engineers (in the United States) than all the railways, highway commissions, municipal governments, and the national government combined. Prepare yourself for a growing—not declining—branch of engineering work.

19th YEAR

Wilson Engineering Corporation
College House Offices, Harvard Square, Cambridge, Mass., U.S.A.

CONTRACT WORK WANTED

Special Heavy Machinery

Three plants (one at Harvey, Ill. and two at Birmingham, Ala.) equipped for handling large work of any kind, particularly for utility plants and large construction projects. Machine facilities include:

Boring Mills up to 28-ft. dia.
Planers up to 148-in. wide, 30-ft. long
Lathes up to 60-in. dia., 20-ft. long
Drills—unlimited capacity

A complete engineering staff (mechanical, chemical, combustion) is available to develop and design new or special equipment of all kinds. Let us help you solve your problems.

GOSLIN-BIRMINGHAM MFG. CO., Inc.
Contract Department **Birmingham, Alabama**

Organized to SERVE–

In one year the SEARCHLIGHT SECTIONS of the McGraw-Hill Publications printed 30,738 advertisements.

The thousands of orders received by the *Searchlight Department* every year have given us the experience necessary for handling your orders promptly and efficiently.

We are always ready to extend cooperation in helping you solve your problems. You are invited to take advantage of our service.

Write today to—

SEARCHLIGHT DEPARTMENT, Tenth Ave. at 36th St., New York

G-94A

POSITIONS WANTED

CIVIL engineer, 39, concrete, asphalt and macadam paving, sewerage, waterworks, dams, reinforced concrete, bridges, land development, mechanical work, etc. 18 years' experience. Locate anywhere, available immediately. PW-892, Engineering News-Record, Tenth Ave. at 36th St., New York.

CIVIL engineer, graduate, age 27, single; 5 years' experience designing, detailing and selling reinforcing steel and other steel products. Thoroughly familiar with concrete, desire connection with contractor or bar company. Location immaterial. PW-889, Engineering News-Record, 520 No. Michigan Ave., Chicago, Ill.

ENGINEER, age 39, wide experience bridges, roads, foundations. PW-866, Engineering News-Record, Tenth Ave. at 36th St., New York.

GRADUATE civil engineer, married, age 31, nine years experience, field and office, sewers, materials, bridges, caissons, water supply. Desires position with engineer or contractor. Eastern states. Excellent references. Salary $250. PW-876, Engineering News-Record, Tenth Ave. at 36th St., New York.

Surveyor

SURVEYOR instrumentman, civil engineer. Eight years' experience, topographic maps, plant construction and estimates, wants position. J. H. Wingarel, Wilsonville, Ala.

Draftsmen and Designers

DRAFTSMAN, 15 years experience structure, transmission, tower and substations. Work anywhere. PW-880, Engineering News-Record, 520 No. Michigan Ave., Chicago, Ill.

HIGHWAY designer available after January First. Capable of organizing or supervising a highway office. Nine years experience. PW-877, Engineering News-Record, 520 No. Michigan Ave., Chicago, Ill.

Superintendents

CONSTRUCTION superintendent and engineer. Age 33. Technical. Experienced responsible charge survey, investigations, design and construction of bridges, dams, power plants, waterworks, heavy foundations and tunnels. Unusual executive experience. PW-887, Engineering News-Record, 520 No. Michigan Ave., Chicago, Ill.

CONSTRUCTION superintendent and general superintendent, sewers, water, paving, excavation, sewage disposal, filter plants, reinforced concrete, general construction. Complete charge of work. Experienced wet sewers, sheeting and rock. Handle men and equipment. Estimate. Graduate civil engineer. Married, age 35. Experience covers wide territory. PW-891, Engineering News-Record, 520 No. Michigan Ave., Chicago, Ill.

GENERAL superintendent or branch office manager, twenty years' experience in building business, and graduate civil engineer. Six years' general superintendent for large construction company in Midwest, supervising three hundred construction projects in this time. Several records established for speed of construction. Established record for ability to get low costs. Best of references. Will go anywhere. PW-888, Engineering News-Record, 520 No. Michigan Ave., Chicago, Ill.

GENERAL superintendent of construction; mature experience all types of buildings. PW-830, Engineering News-Record, Tenth Ave. at 36th St., New York.

SUPERINTENDENT with 25 years' experience in tunnels, and open cut excavations in hard rock, soft ground, and difficult timbering. Tropical experience. PW-883, Engineering News-Record, Tenth Ave. at 36th St., New York.

Miscellaneous

NOTICE to contractors and engineers, available immediately. For the last 9 years with 2 prominent contractors on reinforced concrete buildings, office buildings, various residences, commercial buildings and many industrial projects directly for owners and architects: as solicitor, chief estimator, job management, careful analysis of subcontracts, subletting and their various phases. Knowledge of costs derived from actual experience. Structural engineer in both reinforced concrete and structural steel. Familiar with various floor systems and their economic uses. Excellent references, 36 years old, college education, married. Assoc. M. of the Soc. C.E. Licensed professor engineering in Pennsylvania. PW-890, Engineering News-Record, 1600 Arch Street, Philadelphia, Pa.

For Rent—CRANES

Gasoline crawler SPEEDCRANES, capacities 15 to 20 tons, booms 45 to 90 ft., from the largest fleet in the country.

FOR SALE—Special Offerings on Trade-ins on SPEEDCRANES and SPEEDSHOVELS.

1—**Koehring 12 ton Gasoline Crawler Crane,** 40 ft. boom.
1—**Northwest No. 105 Crawler Crane,** 50-ft. boom.
1—**P & H ½ cu.yd. Crane,** 35 ft. boom with backhoe attachment.
1—⅝ cu.yd. **Mead-Morrison Shovel,** practically new.
1—1 cu.yd. **Osgood Gasoline Crawler,** 45 ft. boom with backhoe attachment.
1—½ cu.yd. **Speeder Crane and Shovel.**
1—40 ton eight wheel **M.C.B. Brownhoist Steam Crane,** 75 ft. boom.
3—10 ton Clyde Steel **Stiff Leg Derricks,** 65 ft. booms, three line service.
1—1 cu.yd. **Thew Steam Crawler Shovel.**
2—15 hp. **Lidgerwood Double Drum Gasoline Utility Hoists.**
1—Triple Drum 75 hp. **Lidgerwood Hoist.**
2—75 hp. **Clyde Triple Drum Hoist,** A.C. Motors.
2—**Byers Bearcats** with crane booms, backhoe and skimmer attachment.
1-cu.yd. **Multifoote Gasoline Paver,** complete. Splendid condition, very low price.

Night Phones: SPRING 2276 PLAZA 5608

Forsythe Brothers INC.

Phone Cortlandt 6272

OFFICE: 30 CHURCH ST., NEW YORK CITY
WAREHOUSE AND YARD: 374 KENT AVE., BROOKLYN, N. Y.

Bids: Jan. 15, 1931.

FOR SALE

Bids will be received by the Sanitary and Drainage Commission for the sale of a Bay City ½-yd. dipper dredge on a well constructed scow 50 feet long, 20 feet wide and 4½ feet deep, up to 12 o'clock noon January 15th, 1931. This dredge is powered by 4-cylinder 60 horsepower gas engine.

This outfit may be seen at Wappoo Bridge, approximately 2 miles from Charleston, South Carolina.

Any party interested in purchasing this dredge may obtain full information by writing the Sanitary and Drainage Commission of Charleston County, South Carolina.

The right is reserved to reject any or all bids.

E. D. JERVEY, Engineer,
Sanitary and Drainage Commission.

Guaranteed Protection for Your Equipment

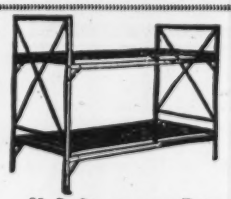
WATERPROOFED
CUT TO SIZE
QUICK DELIVERY
LOWEST PRICE

TARPAULINS
3c.
PER SQ. FOOT

New York Drop Cloth Mfg. Co., 148-150 Greene St., New York City
Established 1881 Tel—CAnal 6-1044

COVERS

WATERPROOFED
3¢
Per sq. ft. up
Barnett Canvas Goods & Bag Co., Inc.
125 Arch St., Philadelphia, Pa.



Double Deck and SINGLE Cots

U. S. Government Extra Heavy New
TARPAULINS
at Half of the Regular Price
Mattresses U. S. Army Blankets Tents
GLOBE SALES & MFG. CO.
636 Broadway, New York City
Spring 7732-7733

CRANES
FOR RENT
with skilled operators
Reasonable Rental Rates
CRANE SERVICE CO.
Cor. St. Charles & Kossuth Sts.,
Newark, New Jersey
Telephones Mitchell 2-6550-6551.

USED REBUILT

SURVEYING INSTRUMENTS

SALE—RENT REPAIRING

Sale-Rent Repair-Trade-Terms
TRANSITS and LEVELS
NEW and USED
Field and office complete equipments
Instrument repairing on all makes.
Southwestern Distributing Agent for Buff & Buff Mfg. Co.
OSWALD GRINER
1108 Oak St., Kansas City, Mo

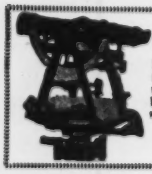
CRANES
FOR RENT

Caterpillar and Truck Cranes

JAS. S. BRADEN
30 Church St., N. Y. Tel. Cortlandt 2809

WE BUY AND SELL STRUCTURAL STEEL

Angles — Beams — Channels — Plates
NEW and USED
Long Island Structural Steel Co., Inc.
400-410 Tiffany St., Bronx, N. Y.



For Quick Disposal
Used Transits and Levels
Rebuilt, guaranteed, GURLEY'S and other good makes from $5[illegible] up. *Act quickly.* Instrument **Rented or Exchanged.** *A makes repaired,* reasonable prices.
J. H. WEIL & COMPANY
1325 Cherry St., Philadelphia, Pa
Established 35 years

WANTED
One Combination 1¼-Yard Steam Shovel and 50-Foot Crane
Two 15-ton capacity Gasoline Cranes with 50-ft. boom, less than two years old. Submit full particulars and bottom prices.
W-870, Engineering News-Record
Tenth Ave. at 36th St., New York City

RE-BUILT
REPAIR
RENT
REAL EXPERTS

BUFF, 69 Dey St., New York

CRANES FOR RENT
COMPLETE MACHINERY AND EQUIPMENT CO., INC.
Tel. Ironside 8600
Webster Ave. and Hancock Street, Long Island City, N. Y.

WANTED
2—40 or 50 ton **American St. Locos.**
2—**Steam Drag Lines,** 2½ yd., 90 ft. boom.
2—125 or 150 hp. **Scotch Marine Boilers.**
Give details, age, price.
W-886, Engineering News-Record
520 N. Michigan Ave., Chicago, Ill.

WANTED
ENGINEER'S TRANSIT
Describe fully in first letter, stating make, age, condition and price.
THE HAMILTON GRAVEL CO.
Hamilton, Ohio

CRANES, SHOVELS, DRAGLINES AND PULLSHOVELS
Expert Operators
RENTAL—CONTRACT — OR YARDAGE BASIS
THE E. & F. SMITH CO., INC.
50 Church St., New York City
Tel Cortlandt 6766. Eve. Tel. Jamaica 0586

WANTED
BYERS BEAR CAT
with crane boom for CASH. Advise condition, age and location.
F. A. BENNETT
30 Church St., New York, N. Y.

USED EQUIPMENT

AND NEW, OFFERED FOR RE-SALE

Space for these advertisements is sold by the advertising inch—30 inches to a page. The price per inch is based on total space used—multiply ad space by number of insertions.

RATE PER INCH

1 to 3 inches	$6.00	an inch
4 to 7 inches	5.75	an inch
8 to 14 inches	5.50	an inch

An inch is measured vertically on one column—three columns to a page. Any space may be used measured by the even inch in height by 1, 2, or 3 columns in width.

RATES FOR LARGER SPACES, OR SPACE ON A YEARLY BASIS, FURNISHED ON REQUEST.

Alphabetical Index to Advertisements

ADVERTISEMENTS OF EQUIPMENT FOR SALE RECEIVED TOO LATE FOR LOCATION ON THE FOLLOWING PAGES

appear on the page or two preceding as do also advertisements of Equipment Wanted and For Rent.

GENERAL CONTRACTORS EQUIPMENT

Barnett Canvas Goods & Bag Co., Inc. 90
Bay City Shovel, Inc. 94
Bennett, F. A. 90
Braden, Jas. S. 90
Buff 90

Clapp, Riley & Hall Eq. Co.. 94
Charleston County 90
Christman-Burke Co., H. G. . 94
Cohen, Chas. F. 94
Complete Machinery & Equip. Co. 90
Crane Service Co. 90
C. V. Service Inc. 96

Dolan & Sons, Hugh. 96
Duluth Iron & Metal Co. 96

Ellis, A. Lee 94
Equip. Corp. of America..... 93
Excavating Equipment Dealers Inc. 91-92

Forsythe Bros., Inc. 90
Frank, M. K. 96
Frazier-Davis Const. Co. ..94-95

Globe Sales & Mfg. Co. 90
Grey Steel Products Co., Inc.. 92
Griner, Oswald 90

Haiss Mfg. Co., Inc., Geo.... 91
Haller Const. Co. 96
Hamilton Gravel Co. 90
Hoisting Machinery Co. 92
Hyman-Michaels Co. 92

Jervey, E. D. 90
Johnson & Hoehler 94

King, Philip T. 94

Lane Equip. Co., T. J. 92
Lindheimer, Inc., S. W. 95
Long Island Structural Steel Co., Inc. 90

Marine Metal & Supply Co... 96

New York Drop Cloth Mfg. Co. 90
New York Trap Rock Corp... 96

O'Neill Co., A. J. 92

Perry, Buxton Doane Co. 96
Pulsometer Steam Pump Co.. 96

Read Corp., Howard W. 92
Rennolds Equipment Co. 92

Schoonmaker & Sons, Inc., A. G. 96
Service Inc., C. V. 96
Sherwood Co., E. C. 96
Smith Co., Inc., E. & F. 90
Southern Iron & Equip. Co.. 92
Stryker, Inc., A. 96

Wannamaker & Wells, Inc. .. 96
Walsh, J. T. 91
Weil & Co., J. H. 90
Weiss, B. M. 91
Wemlinger, Inc. 95
Wynn, Terrence P. 96

PILING

Brown & Sites Co. 95
Equip. Corp. of America..... 95
Foster Co., L. B. 94
Frazier-Davis Constr. Co..... 95
Hyman-Mitchaels Co. 95
Lindheimer, Inc., S. W. 95
Wemlinger, Inc. 95

PIPE

Albert & Davidson Pipe Corp.. 96
Albert Pipe Supply Co., Inc.. 96
Greenpoint Iron & Pipe Co., Inc. 96
Hudson Pipe & Supply Co.... 96
Marine Metal & Supply Co.. 96
Pfaff & Kendall 96

RAILS

Frank, M. K. 96
Levis & Co., Henry 96
Perry, Buxton Doane Co..... 96
Sherwood, E. C. 96
Southern Iron & Equip. Co... 92

1—General ½-yd. Comb. Shovel & Crane.
34—4-yd. Steel Stone Skips.
1—Byers Skimmer Attachments.
2—50-B Bucyrus Shovel and Dragline.
2—1½-yd. 36-in. gauge Cars.
2—8-ton, 36-in. ga. Locos., Plymouth.
4—8-ton, 36-in. gauge Electric Locos.
125—Pcs. 7-in. Lack. Piling, 8 ft.
1—25-ton Ohio Loco. Crane, 75-ft. b'm.
12—4- and 5-yd., 36-in. ga. Dump Cars.
2—Compressors, 458 and 610 ft.
2—Linn Tractors—used 3 months.
1—1-yd. Osgood Gas Shovel.
1—50-ton Derrick.

J. T. WALSH
500 Brisbane Bldg., Buffalo, N. Y.

Check HAISS As Your Source of GOOD FACTORY REBUILT EQUIPMENT

FACTORY REBUILT CLAM SHELL BUCKETS
1—Hayward ¼-yd. "Class E" Bucket.
1—Haiss ½-yd. "Hi-Power" Bucket.
1—Blaw-Knox ¾-yd. "Lever-Arm" Bucket.
1—Haiss ¾-yd. "Contractor" Bucket.
2—Haiss 1-yd. "Contractor" Bucket.
1—Hayward 1-yd. "Class E" Bucket.
1—Haiss 1-yd. "Hi-Power" Bucket.
1—Haiss 2½-yd. "Hi-Power" Digging Bucket.

PORTABLE BELT CONVEYORS
2—Haiss 16-in.x25-ft. long Rebuilt Conveyors with 2 cyl. LeRoi Engine.

FACTORY REBUILT TRUCK LOADERS
1—Haiss Model 26 Creeper Path Digging Loader with 37-hp. Waukesha Engine.

GEORGE HAISS MFG. CO., INC.
140th St. & Rider Ave., New York City

2 Model 600 P & H's
1-Yard Shovels
ONE DIESEL AND 1 GAS
Four Months Old

1 Model 105 Northwest Crane
40-Ft. Boom Rebuilt
Immediate Delivery

Excavating Equipment Dealers, Inc.
1704 Willow Ave., Hoboken, N. J.
Hoboken 3-2600

RENT OR BUY THIS EQUIPMENT

AIR COMPRESSORS
2—310-cu.ft. Ing.-Rand Gas Port.

CARS
20—4-yd. Koppel 36-in. ga., steel un'frame dump.
50—12-yd. Western std. ga. Air Dump Cars.
10—20 cu.yd. K.&J. Standard Gauge Dump.

CRANES—GANTRY
2—15-ton Link-Belt Gantry Cranes, full revolv. with 90-ft. bm., mtd. on 30-ft. towers, st. oper.
1—100-ft. Boom Industrial Broad Ga. Elect Crane, with 4 cu.yd. clamshell bkt., prac. brand new.

LOCOMOTIVE CRANES
1—25-ton, 8-wheel std. ga. Browning, 50-ft. bm.
1—15-ton Link Belt D.D. 50-ft. bm., new 1923.

DERRICKS—COMPLETE
1—5-ton Insley Steel Guy Derrick, 95-ft. mast, 85-ft. Boom, 12-ft. Bullwheel, bucket operating.
1—5-ton all steel 50-ft. boom, 42-ft. 8-in. mast, stiffleg, fittings.
1—10-ton Shannon wooden stiffleg Derrick. Bucket operating, 50-ft. boom.
1—10-ton Terry All Steel 3-line 100-ft. boom, 45-ft. mast, 16-ft. bullwheel.

GASOLINE CRANES
1—10-ton McMyler Crawler, 40-ft. boom.
1—15-ton Link-Belt K2, 60-ft. boom.
2—15-ton Byers, 50-ft. boom.

HOISTING ENGINES
1—80 hp. Lidgerwood, 2-drum, 80 hp. A.C., 440 v., 3 ph., 60 cy. Motor, Controller and Grids.
1—75-hp. National T.D., independent mtr. driven swing, and bank lvr. cont., 3 ph., 60 cy., 440 v.
1—60-hp. National 3-drum with independent swinger, 3 ph., 60 cy., 220 v.
1—75-hp. Lidgerwood T.D. 4-cyl. Gas w. Swinger.
1—60-hp. D.D. Mundy, 4-cyl. Gasoline.
1—50-hp. Lidgerwood T.D. 4 cyl. Gas w. Swinger.
1—15-hp. single Drum Meade Morrison Gasoline.
1—10x12, 3-drum Clyde Skeleton, with Swinger.
1—8¼x10 Triple Dr. Lidgerwood, A.S.M.E. blr.
1—7x10 Lidgerwood, 3-drum, swinger attached, A.S.M.E. Boiler.

KEYSTONE GRADER
1—No. 4 Cat Gas Keystone, equip. with skimmer and ditcher at., ⅝ and 9/10-yd. dip. rebuilt.

LOCOMOTIVES—STEAM
1—11x16 Amer. 4-wh. Std. Ga. S.T. New 1926.
2—11x16 Davenport std. ga. Saddle Tank.
1—80-ton American 6-wheel Saddle Tank 0-6-0.

LOCOMOTIVES—GASOLINE
1—6-ton Whitcomb, 24-in. gauge, gasoline.
2—14-ton Plymouth, 36-in. gauge, gasoline.
1—30-ton Plymouth, standard gauge.

PUMPS
7—4-in. Suction, 4-in. Discharge Submersible Mtr. Driven Pumps, 15 HP., 3 ph., 60 cy., 220 v. mtrs., cap. 425 GPM at 75-ft. head or 690 GPM free discharge. Complete and brand new.
1—6 and 8-in. CH&E Centrif., 4-cyl. gaso. eng.

ROLLERS—GASOLINE
1—10-ton Buffalo-Springfield 3-wh., 4-cyl.
1—10-Ton Huber 3-whl., 4-cyl. with Scarifier.
1—5-Ton Good Roads, Jr., 3-whl.

SHOVELS
1—1-yd. Link-Belt Caterpillar Gas., rebuilt.
1—¾-yd. Marion 21 Tra. Mtd. St., High Lift.
1—Model 92 Marion Cat, electric, 4-yd. dipper. Ward-Leonard control.
1—¾-yd. P&H Model 206 Shovel Front, Complete.
1—1-yd. Link Belt Shovel Front, complete.

PNEUMATIC TOOLS
2—Ingersoll-Rand Concrete Breakers.
Complete stock of rebuilt and guaranteed Tools such as Boyer 60 and 80 Hammers, BK-2 Chipping Hammers, Thor No. 8 Close Quarter Drills, etc. All of these Tools are priced less than 1/3 of new cost and are sold with 100% guarantee.

B. M. WEISS, Phone: Rittenhouse 231 1324 Widener Bldg., Philadelphia, Pa.

SELL OR RENT

TRACTOR

1—"60" Caterpillar Tractor, without bull-dozer; excellent condition.

CRANE

41B Bucyrus Crane, 60 ft. Boom. Bought New, May, 1930

TRUCK CRANE

6½-ton UNIVERSAL, with or without Christy Crawlers. This outfit was purchased new April, '28.

PORTABLE AIR COMPRESSORS

5½x5, 110 ft., Ingersoll-Rand.
10x8, 310 ft., Ingersoll-Rand.

Howard W. Read Corporation
800 North Delaware Ave., Philadelphia, Pa.

Still Time to Finish the Job!

—With One of These Bargains—

BUY OR RENT WITH OPTION TO PURCHASE

Thew 1-yd. gasoline Shovel and Clamshell, a bargain. Located at Chicago plant.

P&H Model 206—¾ yd. Shovel. Ready for immediate delivery. Specially priced. At Hoboken plant.

Northwest 104 — 1 yd. Clam. Reconditioned. Ready to go. Hoboken plant.

P&H Model 700 Dragline and Shovel. At Chicago plant.

Marion No. 32—1 yd. Steam Shovel on full crawlers. An exceptional buy. Located at Pittsburgh.

P&H 10-30 Trencher completely rebuilt and guaranteed; at West Allis plant.

P&H Model 600 — 1 yd. Shovel with crane attachment. Sold with a new machine guarantee. At the Chicago plant.

Koehring ¾-yd. Shovel and Dragline in excellent condition, priced right; at Hoboken plant.

P&H Model 206-B ⅞ yd. Shovel. Practically as good as new. At West Allis plant.

Truck Crane, P&H, 7½-ton Model mounted on Mack Truck; at Chicago plant.

Prices Lower Than Ever Before

—

Liberal Terms

—

Buy For Next Year

EXCAVATING EQUIPMENT DEALERS, INC.

Hoboken, N. J. 1704 Willow Ave.
West Allis, Wis. 5903 Greenfield Ave.
Los Angeles, Cal. 2248 E. 37th St.
Berkeley, Cal. 2657 Ninth St.
Chicago, Ill. 1038 W. Division St.

RELIABLE EXCAVATING E·E·D EQUIPMENT

FOR SALE

P & H Model 206, ¾-yd. Dragline.
Byers, 10-ton Caterpillar Crane, ¾-yd. Clam.
O. & S. 22½-ton Loco. Crane, 50-ft. Boom.

CARS

16—12-yd. Western, Steel Beam Dump Cars.
10—50-ton Capacity All Steel Twin Hopper Cars.

LOCOMOTIVES

75-ton, 20x26-in., 6-Driver Switcher, A.S.M.E.
50-ton 18x24-in., 6-Driver Switcher.
92-ton 20½x28-in. Mikado (2-8-2) BUILT 1922.
35-ton, 13x20-in., 4-Driver Saddle Tank, A.S.M.E.
56-ton, 18x24-in., 4-Driver Sad. Tank.

We have over forty Locomotives in stock rebuilt and ready, all types, 10 to 100 tons.

Southern Iron & Equipment Co.
Est. 1889
Atlanta, Ga.

CONSTRUCTION EQUIPMENT —WE BUY—SELL—TRADE—RENT

AIR COMPRESSORS
1—Ing.-Rand 525-ft. belt drive.
11—Port. Gas from 30 to 860 cu.ft., including I.-R., Chicago and Schramm.

BUCKETS
6—Clam Shells, ½ to 1½ yd.
4—Bottom dump, 30 ft.
2—Page Dragline, ¾ and 1 yd.

CRANES, DRAGS AND SHOVELS
8—Including Northwest, Link-Belt, P.&H., Moore Speed, Byers, etc., crawling and loco. type.

PUMPS
12—Centrifugal 3-4-5-6-8 & 15-in.
20—Diaph. & Plungers; all sizes.

HOISTS AND DERRICKS
1—Ersted D/D with Fordson tractor.
6—Gas Hoists, 6 to 40 hp.
1—American 8¼x10 D/C D/D.

ROAD AND PAVING EQUIPMENT
2—Koehring pavers, 21E.
2—Barber-Greene Loaders, 42 and 25.
2—5-Ton Cat. tractors.
6—Locomotives, 24-in., 36-in. ga., 4 to 8-t. Various makes.
3—Fordson tractors.
2—Miles 24-in. ga. track.

MIXERS
10—Concrete and Mortar Mixers from 7 to 28 S.

MISCELLANEOUS
12—Boilers 15 to 75 hp.
1—Austin Backfiller.
3—No. 1 McKiernan sheetg. ham.
1—No. 3 Jeffrey Lime Pulverizer.
2—Portable Saws with Gas Pwr.
2—Vulcan Pile Hammers, Nos. 3 & 4.
1—Buckeye Trencher, digs 6½-in. deep.
1—Todd Arc Welder. New.
1—Insley 100-ft. m., ½-yd. bkt.
1—Amer. 160 ft. sgle. st. tower.
1—Johnson 85 ton bin.

Almost all the above is in stock at our Hammond, Ind., rebuilding Plant. We also have listed with us equipment exceeding $1,000,000 in value.

RENNOLDS EQUIPMENT CO., 1605 Tower Bldg., CHICAGO, Illinois

SHOVELS AND CRANES

1—**Lorain 75-A, Gas,** 1¼-yd., 1929.
1—**Koehring, Gas,** ¾-yd. rebuilt 1930.
2—**50-B Bucyrus,** 2-yd., late 1927.
1—12-ton **Northwest,** 40-ft. used 3 mos.

GREY STEEL PRODUCTS COMPANY, Inc.,
111 Broadway, New York, N. Y.

CARS

20—4 yd., 36 in. ga. Western Dump Cars.
4—6 yd. std. ga. Western Dump Cars.
12—12 yd. std. ga. Western Dump Cars.
6—41 ft. 80,000 lb. cap. Steel Flat Cars.
8—41 ft., 100,000 lb. cap. Steel Flat Cars.
10—41 ft., 100,000 lb. Steel Gondola Cars.
4—60 ft. Bag. and Pass. Bunk Cars.

EQUIPMENT

2—80-hp. Clyde Single Drum Electric Hoists.
2—150-hp. Scotch Marine Boilers, 130 lb. Steam.
1—10-ton Steel Stiffleg Derrick, 70 ft. boom.
No. 6, 7 and 9B2 McKiernan-Terry Hammers.
No. 1 and 2 Vulcan Steam Pile Hammers.
1—20-ton Plymouth std. ga. Gas Locomotive.

RAILS

All weights. Large Stocks. — Portable Steel Track.

HYMAN-MICHAELS CO.
20 No. Wacker Dr. Bldg., Chicago, Ill.
Railway Exchange Bldg., St. Louis, Mo.
New York San Francisco

We buy and sell modern equipment for

Contractors, Quarriers, and Sand and Gravel Plants

A. J. O'NEILL CO.
1524 Chestnut St., Philadelphia, Pa.

Sixty Caterpillar Tractor and 2 Maney 1¼-yd. Scrapers.
Erie Caterpillar Steam Shovel, 36-ft. boom and Clam Shell Bucket.
Marion 21 Caterpillar Combination Shovel Crane and Dragline Complete.
All kinds of Contractors Equipment.

THE T. J. LANE COMPANY
Springfield, Ohio

FOR SALE OR RENT

CRANES

2—Northwest Model 105 Crawler Cranes, 40-ft. booms.
2—Browning 20-ton, 8-wheel Locomotive Cranes, 50-ft. boom and double powered drums on one and 46 ft. boom and standard bucket handling drums on other.
1—Browning 20-ton, 8-wheel Locomotive Crane, 50-ft. boom, in Philadelphia.
1—Browning 15-ton Crawler, 50-ton boom.
1—Browning 7½-ton **Truck Crane.**

HOISTING MACHINERY CO.
50 Church Street, New York

NEW TYPE E-2

Bucyrus-Erie 1½-yard Diesel Shovel and Dragline

VERY LATEST MODEL.. NEVER USED.. BARGAIN PRICE

F. S. 839, Engineering News-Record
520 No. Michigan Ave., Chicago, Ill.

BINS AND BATCHERS

2—Blaw-Knox Batcher Plants with 250-ton steel bins, each with No. 56 sand inundator and No. 500 volume stone batcher and cement weighing device.
4—Same as above with steel bottom for wood bins.
1—Blaw-Knox 117-ton all steel bin with sand and stone batchers for ¾- or 1-yd. mixers, stone batcher and No. 28 inundator for 1-yd. mixer.
1—Blaw-Knox 72-ton, all Steel Bin with Batchers for ¾- or 1-yd. mixer.
1—Blaw-Knox 65-ton Bin with stone and sand batchers for 28-S mixer.
4—Blaw-Knox 35-ton Bins No. 14 inundator and with batchers for ½- or ¾-yd. mixer.

BUCKETS

69—Clam Shell, Orange Peel and Dragline Buckets, sizes 1½-yd. to ½-yd.

CARS

74—36-in. gauge 5 yd. cap. two way Dump Cars. 59—Koppel and 15—Continental.
6—Standard gauge Flat Cars, capacity 60,000 to 100,000, full M.C.B., all with air brakes, lengths 36 ft. to 40 ft.
16—Special Easton Std. Ga. Concrete Cars, one side dump, for handling 2 cu.yds. concrete.
27—Flat Cars; 4—Easton Standard Gauge, Platform 6-ft.x10-ft.; 16—Koppel 36-in. ga., platform 4-ft.x15-ft.; 7—Easton 24-in. ga., platform 3½x5-ft.
5—Lakewood, 2-yd. capacity, 36-in. gauge, radial gate, concrete cars.
45—24-in. ga. V Shaped cars; 20—Koppel, 40 cu.ft.; 25—Lakewood, 18 cu.ft.

COMPRESSORS

1—Ingersoll-Rand Duplex, single stage, size 16x14, rated 1,198 cu.ft. at 30 lbs. pressure.
15—Portable gasoline driven rated 92, 118, 160, 210, 310 cu.ft. Ingersoll-Rand, Sullivan, Chicago Pneumatic and Domestic.

CONCRETE MIXERS

2—Size 56-S Mixers, with batch hopper with or without power. 1—Smith tilter. 1—Ransome.
1—Smith 40-S Tilter, with or without electric motor.
73—Concrete Mixers, 28-S, cap. 1-yd.; 21-S, cap. ¾-yd.; 14-S, cap. ½-yd. With steam or electric power with side loaders or batch hoppers. Following makes: Marsh-Capron, Koehring, Milwaukee, Ransome, Smith, Smith-Chicago, Rex, Lakewood, Foote or Oshkosh.
10—10-S with side loaders and water tanks and LeRoi Gasoline Engines.
24—7-S cap. 1 bag with side loaders and low charging platforms, with gasoline engines.

CONVEYORS AND ELEVATORS

6—Portable Belt Conveyors with steel frames, with gasoline or electric power. 3—Barber-Greene, one 24-in. belt 70-ft. centers. One 18-in. belt, 60-ft. centers. One 18-in. belt, 24-ft. centers. One Northern 24-in. belt, 36-ft. centers. One Jeffrey 16-in. belt, 30-ft. centers.
3—Link-Belt Bucket Elevators. Two with 12-in. x7-in. Buckets 82-ft. centers; one cement Bucket Elevator No. 30 with boot 50-ft. centers.
3—Weller No. 3 Bucket Elevators with wood frames 50 to 65-ft. centers.
1—"Rex" Vertical Centrifugal Discharge Bucket Elevator 42-ft. centers. All enclosed buckets 16x7x7¼.

INDUSTRIAL TRACK

15—Miles 36-in. gauge, 25-lb. portable industrial Track with 7 riveted ties per 15-ft. section with slip joint tie and fish plate connections.
3—Miles 24-in. ga., 20-lb. Riveted Track in 15-ft. sections.

"Caveat Emptor!"

was Roman for

"IS IT GUARANTEED?"

Literally, it meant "let the buyer beware." We suggest every modern buyer think **"Guarantee"** first—last—all the time—for there's **safe** economy, **real** savings only in honestly **guaranteed** "used equipment."

You buy a power shovel, for instance, to do certain work. You know what you want done. You can — through **"E.C.A."** pick up a rebuilt shovel that **"E.C.A."** honestly GUARANTEES to do the job—at an immense saving on purchase or rental cost. The whole economy lies in the guarantee—in the reputation behind the rebuilder—in his skill in rebuilding.

Think, then . . . over 3,200 hard-headed contractors know this. They turn to **"E.C.A."** FIRST whenever it is a question of buying. They know that there is safe and sound economy in buying or renting used equipment from **"E.C.A."** The items shown here are only a "drop in the bucket" of what we have. Get in touch with **"E.C.A."** today.

CRANES (Crawler)

1—Austin Wolverine, 15-ton capacity, with 50-ft. boom on full crawlers, gasoline operated.
1—Link-Belt gasoline, Model K-1, 10-ton on full crawlers, with 50-ft. boom. Shop No. K-1024.
1—Northwest Model 104, one with 40-ft., one with 45-ft. boom, equipped with fair leads, on full crawlers. Shop No. 1061.
2—Brownhoist No. 2 gasoline cranes, mounted on full crawlers; 10-ton capacity, with 40-ft. boom; Shop Nos. 9961 and 9859.
1—Brownhoist No. 1, 7-ton capacity, with 35-ft. boom, full crawlers, gasoline.
1—Industrial Brownhoist, type C.C. gasoline, on crawlers, combination crane and shovel, ½-yd. dipper, 36-ft. boom.
1—Austin No. 5 gasoline, with 36-ft. boom, on full crawlers.
1—Byers, Model 10, steam, on half crawlers, with 30-ft. boom.
1—Type "B" Erie crane or dragline, with 40-ft. boom and ⅝-yd. bucket, also with steam shovel boom and 1-yd. dipper. Shop No. 3900.

CRANES (Locomotive)

1—Ohio, 30-ton, standard gauge, 50-ft. boom; Shop No. 3367.
1—Ohio, 25-ton, standard gauge, 8-wheel, with 50-ft. or 60-ft. boom; Shop No. 1780.
1—Browning No. 8, 25-ton, with 50-ft. booms; 8-wheel M.C.B.; Shop No. 2143.
1—Browning No. 2, 4-wheel standard gauge, with 50-ft. boom; Shop No. 643.

DERRICKS

1—American 10-ton Steel Stiff Leg Derrick, 40-ft. mast, 80-ft. boom, 16-ft. bull wheel.
1—Lambert 10-ton All Steel Guy Derricks, 70-ft. boom, 85-ft. mast, 14-ft. bull wheel for hook or bucket work.
1—Dobbie, 5-ton, all steel guy derrick, with 70-ft. mast and 62-ft. boom.
50—American wooden stiff leg derricks, some with 16-in. fittings, and with 80-ft. booms and 16-ft. bull wheels, some with 14-in. fittings, with 50 to 70-ft. booms, and 12-ft. bull wheels, arranged for hook work or clam shell.

HOISTS

131—Electric, gasoline and steam hoists, single, double and triple drum. Our stock consists of: 42—electric hoists ranging in size from 100-hp. down to 20-hp., with A.C. or D.C. motors. 26—gas hoists ranging in size from 120-hp. down to 8-hp. 63—steam hoists in sizes from 12-in.x12-in. down to 4¾x6-in., with and without boilers.
3—Single Drum High Speed Builders Hoists with D.C. motors. 1—100 hp. Mead-Morrison. 1—85 hp. Mead-Morrison; 1—85-hp. Lidgerwood.

LOCOMOTIVES (Gas)

25—Gasoline Locomotives as follows: 4—Plymouth 14-ton, 36-in. gauge; 3—Plymouth 8-ton, 36-in. gauge; 7—Whitcomb 8-ton, 36-in. gauge gear drive; 1—Whitcomb 7-ton, 36-in. gauge; 1—Plymouth 7-ton, 24-in. gauge Friction Drive; 1—Plymouth 7-ton, 24-in. gauge gear drive; 1—Milwaukee 7-ton, 24-in. gauge; 2—Plymouth 4-ton, 24-in. gauge, Friction Drive; 1—Plymouth 3½-ton, 24-in. gauge, Friction Drive; 2—Brookville Fordson 2-ton, standard gauge; 1—Brookville Fordson 2-ton, 36-in. gauge.

SHOVELS

1—Type 37 Marion, full revolving steam shovel, on crawlers, 1¾-yd. dipper. Shop No. 5308.
1—Erie, type "B2" shovel, with 1-yd. dipper and equipped with 40-ft. crane boom, ¾-yd. clamshell bucket. Shop No. 3900.

TRACTORS

1—Tractor, 10-ton Caterpillar, with front pole hook. Model No. 60, Serial No. PA 241.
1—Automobile Tractor Truck, "Linn", 65 HP., 4-cyl., gasoline motor. Model 25D; tractor capacity, 10,000 lbs.; weight, 14,000 lbs., fitted with wood, steel lined, dump, body with mechanical dump.
1—Tractor, Tioga Contractor type No. 1057. Engine No. 1199, 5-ton, Model T-3, with pulley on side.

Write for new stock list just off the press listing our complete stock of equipment owned by us.

EQUIPMENT CORPORATION OF AMERICA

PITTSBURGH, PA.
855 Empire Bldg.
Phone: Grant 6100

CHICAGO, ILL.
1155 S. Washtenaw Ave.
Phone: Seeley 5100

PHILADELPHIA, PA.
655 Horn Bldg., 1601 Chestnut St.
Phone: Rittenhouse 6100

Guaranteed Equipment

For Sale or Rent

OVERHAULED IN OUR OWN SHOPS AND GUARANTEED SUBJECT TO THOROUGH TRIAL IN SERVICE.

LOCOMOTIVES: Steam and Gasoline, 7 to 65 tons, Narrow and Standard Gauge.
DUMP CARS: 4-yd. to 30-yd. Hand and Air Dump, Narrow and Standard Gauge.
GASOLINE CRANES, SHOVELS, DRAGLINES: ¾ to 1¼-yd. Link-Belt, Northwest, Harnischfeger, Koehring.
LOCOMOTIVE CRANES: 15 to 30-tons, Ohio, Brownhoist, Industrial, Browning.
STEAM SHOVELS: Full-revolving Caterpillar and Railroad Types.
SPREADER CARS: Narrow and Standard Gauge, All-Steel, Air Operated.
DRAGLINES: Caterpillar or skid and roller mounting, 50 to 125 ft. booms.
SHOVEL REPAIRS: Bucyrus, Marion, Link-Belts, etc.
MISCELLANEOUS CONSTRUCTION EQUIPMENT: Air Compressors, Gas and Steam Rollers, Pile Hammers, Pumps, Hoists, etc.

CLAPP, RILEY & HALL EQUIPMENT CO.

12 NORTH CLINTON ST., CHICAGO, ILL. (PHONE FRANKLIN 4028) WORKS: CLYDE, ILL.
543 UNION TRUST BLDG., PITTSBURGH, PA. (PHONE ATLANTIC 4643) WORKS: NEVILLE ISLAND, PA.

Brownhoist Locomotive Crane
For Sale or Rent
20-ton cap., 8 wheel MCB, double drums, 48 ft. 3½ in. boom, A.S.M.E. boiler. Good condition.
PHILIP T. KING
"The Crane Man"
50 Church St., New York.

Elevated Steel Water Tank
100,000 gal. capacity—good as new. Will give away for cost of removing.
H. G. CHRISTMAN-BURKE CO.
1010 Fisher Bldg., Detroit, Michigan

FOR SALE
ELECTRIC CABLEWAY
1—Mundy, 750 ft. span. Complete with hoist, motor, and carriages. Excellent condition. Available immediately.
FRAZIER-DAVIS CONST. CO.
Arcade Bldg., St. Louis, Mo.

Shovels or Cranes
FOR SALE OR RENT
Rental payments may apply on Purchase
1—Factory rebuilt Lima 1¼ cu.yd. capacity. This machine can be equipped with either shovel, clamshell, dragline or drag shovel attachments. Very reasonably priced. Carries new machine guarantee. Located New York, N. Y.
1—Gas-Air Erie Shovel 1 yd. capacity, A-1 condition. Ready for service. Located Richmond, Va.
Marion No. 32 Electric Shovel, 1¼ cu.yd.; 50 hp. G. E. Motor; 3 phase, 60 cycle, 440 v. Splendid condition. Located New York City.
Complete Shovel Attachment for Type "O" Thew, located Buffalo, N. Y. Also, attachment for Type B and B-2 Eries. Located in New Jersey. Decided bargains.
Osgood gasoline shovel 1 yd. capacity. Located Philadelphia. Good condition, attractive price.
1—Linn Tractor, 6-yd. capacity, with Waukesha Motor. Machine in very good condition. Priced to sell quickly. Located New York State.
We have both Steam and Gasoline Excavators ranging from ½ to 1½ cu.yd. capacity in various parts of the country that will be sold at extremely low prices or leased with leased payments made applying on purchase price.
CHAS. F. COHEN
Lima, O., Office: Lima Trust Bldg. Tel. Main 4824
New York Office: 2351 Graybar Bldg. 420 Lexington Ave. Tel. Lexington 9934
Wire or phone at my expense.

COMPRESSORS
Direct Electric Driven
5930 ft. IR PRE-2, 3-60-15, 200-6600-4000-2200.
3460 ft. Chicago OCTDE, 3-60-2200.
2678 ft. IR PRE-2, 3-60-4000.
2212 ft. Chicago OCE, 3-60-2200 or 550.
2200 ft. IR PRE-2, 3-60-2200.
1574 ft. IR PRE-2, 3-60-440.
1302 ft. IR PRE-2, 3-60-220.
868 ft. Sullivan WJ-3, 3-60-440.
528 ft. Pennsylvania, 3-60-550.
Belt Driven
1052 ft. Ingersoll XCB and motor.
868 ft. Sullivan WJ-3.
720 ft. Sullivan WJ-3.
599 ft. Ingersoll XB-2 and motor.
478 ft. Sullivan WJ-3.
458 ft. Ingersoll XRB.
371 ft. Sullivan WG-6.
355 ft. Ingersoll ER-1.
Steam Driven
4384 ft. Ingersoll ORC-3.
2588 ft. Ingersoll OC-3.
1955 ft. Ingersoll XPV-3.
1531 ft. Ingersoll XPV-3.
1166 ft. Ingersoll XPVR-3.
823 ft. Ingersoll XPVR-3.
789 ft. Ingersoll X-4, 60 lbs.
446 ft. Ingersoll X-2.
355 ft. Ingersoll FR-1.
Turbines, Boilers, Engine Sets, Rotaries, Transformers and M.G. Sets. See Electrical World for list of Power Plant Equipment.
A. LEE ELLIS
50 High Street, Boston, Mass.
"The Buyer Must be Satisfied Always"

Bay City
Ditchers and Skimmers
Gasoline driven
Crawler Mounted
Rebuilt and Guaranteed
By the Manufacturers
Bay City Shovels, Inc.
302 Broadway, New York
Phone: Worth 1569

FOR SALE OR RENT
1—10 ton Kelly-Springfield, 3 wh. Roller with Scarifier.
1—No. 4—Keystone Grader, skimmer and ditcher.
1—5 ton Iriquois Tandem Steam Roller.
2—5 ton Holt Caterpillar Tractors.
1—100 cu.ft. Schramm Compressor.
1—Flory 3 drum Hoist and Swinger.
Clamshell Buckets ½ and ¾ yard.
Jaw Crushers 6x15 to 24x36.
Large stock Gyratory Crushers, Screens, Elevators, Rolls, Dry Pans, etc.
JOHNSON & HOEHLER
Fernwood Del. Co. Penna.

Sheet Steel Piling Now Available to you on Exact Cost per Job Basis
Let us quote on the purchase of your present piling.
Your logical supply source for **STEEL PILING**
For Rent — For Sale on Foster "Re-purchase Order"
Phone, write or wire for further information and prices.
L. B. FOSTER COMPANY
PITTSBURGH CHICAGO NEW YORK
Warehouses — Pittsburgh, Pa. Jersey City, N. J. Chicago, Ill. Baltimore, Md. Hamilton, Ohio Norfolk, Va.
Our prices stimulate buyers' preference, and all material is subject to your approval at destination.

STEEL SHEET PILING

NEW and USED

RENTED, LEASED, SOLD and BOUGHT

Richmond, Va., 1708-1722 Lewis St.

Los Angeles, Calif., 2044 Santa Fe Ave.

A NATION WIDE SERVICE
WEMLINGER
STEEL SHEET-PILING

Boston, Mass., 31 State St.

Tampa, Fla., 107 Madison St.

Main Office: New York City, N. Y., 149 Broadway
Chicago, Ill., 228 No. La Salle St.

BROWN & SITES COMPANY, Inc.

A Complete Stock of Standard Sections

STEEL SHEET PILING

Our experience for years in Steel Sheet Piling makes it valuable to secure our unbiased recommendations.

Main Office: 30 Church St., New York Telephones: Cort. 1188-1189-1250-1379-3124-5671

STEEL SHEET PILING

LINDHEIMER SUCCESSFUL PERFORMANCE GUARANTEE SERVICE

NEW USED

FOR FOUNDATION, COFFERDAM AND SEWER WORK

Our REPURCHASE GUARANTEE applies ON NEW AND USED SHEETING

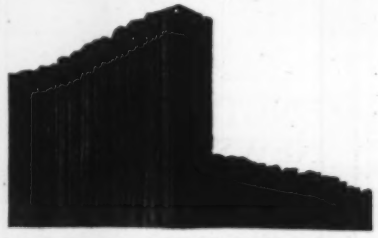
Efficient Engineering Staff to Assist on Any Piling Problems

SOLD
RENTED
BOUGHT

S·W·LINDHEIMER INC.

38 South Dearborn Street CHICAGO, ILLINOIS Phone State 8561

Chicago Phone
RANdolph 8787



STEEL SHEET PILING

NEW AND USED

SOLD BOUGHT — Stocks at principal points throughout the country for prompt shipment — RENTED REPURCHASED

HYMAN-MICHAELS COMPANY

ST. LOUIS CHICAGO 20 N. Wacker Drive SAN FRANCISCO

HOUSTON LOS ANGELES NEW YORK SEATTLE

FOR EVERY BUSINESS WANT

"Think Searchlight *First"*

FOR SALE

PILE HAMMERS

2—11B McKiernan-Terry Steam Hammers in excellent condition.

FRAZIER-DAVIS CONSTRUCTION CO.
Arcade Building, St. Louis, Mo.

PILING

All Makes and Sizes, Bought, Sold or Rented

Equipment Corp. of America
1154 S. Washtenaw Ave., Chicago, Ill.
Philadelphia, Pa. 655 Horn Bldg., 1601 Chestnut St.
Pittsburgh, Pa. 855 Empire Bldg.

PIPE EVERY DESCRIPTION FOR ANY PURPOSE PIPE

ALBERT & DAVIDSON PIPE CORP.

Established 1904

Sunset 1900 NEW PLANT 2nd Avenue, 50th-51st Streets, Brooklyn, New York

---

All Sections of Relaying Rail in Stock

Relaying Rail with Angle Bars

7-ton Whitcomb Locomotive, recently overhauled, in perfect condition.
Three miles of good serviceable 24 in. ga., 20 lb. portable track. ***Attractive prices quoted.***

M. K. FRANK
220 East 42nd Street, New York City — Clark Bldg., Pittsburgh, Pa.

New — RAILS — *Relaying*

Save money—get our prices before you buy new or relaying rails. All sizes—high grade—priced right. Also track supplies—spikes, bolts, switches, frogs, etc. Write today.

THE PERRY BUXTON DOANE CO.
P. O. Box 5253, Boston, Mass.

---

50 tons 100 lb. Relaying Rails.

150 tons 80 lb. Relaying Rails.

HENRY LEVIS & COMPANY
Commercial Trust Bldg., Philadelphia

RAILS

Track Materials — Railway Equipment

E. C. SHERWOOD 1953 Hud. Ter. New York

Telephone—Cortlandt 3322-3323

Brand New Wire Rope For Sale

2¼ in.-6x37, Galv. Plow Steel, 1106 ft.
2 in.-6x19, Plow Steel, 550 ft.
1⅞ in.-6x19, Plow Steel, 1570 ft.
1¾ in.-6x19, 900, 740, 720, 690, 440 ft. each reel.
Also 300,000 ft.-lin., ⅞, ¾, ⅝ and 9/16, in long and short lengths.

TERRENCE P. WYNN
151 West 66th St., New York City

REVOLVING SCREENS

4—48 in. x 20 ft. Allis-Chalmers with 18-ft. jackets, and complete drive equipment (25 hp. motors and Tex-Rope Drives). ALL BRAND NEW IN APRIL, 1930. Plant change necessitates removal this winter. This is the best buy possible in this class of equipment.

Phone or write.

New York Trap Rock Corp.
250 Park Avenue, New York City
Phone Eldorado 0500

FOR SALE

TRACTORS

2—Monarch "50" Tractors, with hydraulic bulldozers and electric lights—less than a year old and in excellent condition.

C. V. SERVICE, INC.
Excavating Contractors
Jericho Turnpike, Mineola, L. I., N. Y.
Tel. Garden City 6020

PIPE

300,000 Feet

Guaranteed Suitable for all practical purposes

New Threads and Couplings.
All sizes from ¼-in. to 24-in.

Also large stock of spiral pipe and fittings. Large stock of valves and fittings, screwed and flanged. Prompt deliveries at attractive prices!

Marine Metal & Supply Co.
167 South Street, New York City

PIPE

IF IT'S **PIPE** SECOND HAND

We have it. All sizes, any quantity. Try us.
Your inquiry means another satisfied customer.

HUDSON PIPE & SUPPLY CO.
33rd St. & C.R.R. of N. J., Bayonne, N. J.

Second Hand Wrought Iron and Steel **PIPE** Overhauled Rethreaded Coupled

All Sizes in Stock

Greenpoint Iron & Pipe Co., Inc.
187-197 Maspeth Ave., Brooklyn, N. Y.

FOR SALE

SHOVEL

1—Koehring No. 301 Shovel, full multi-plane, 4-cylinder gasoline engine, electric starter, full cab, shovel boom 19-ft. 6-in., 14-ft. dipper stick, 1-yd. rock dipper.

HALLER CONSTR. CO., Boonville, Mo.

FOR SALE

Ingersoll-Rand "P-O" Diesel Engine, 17-in. x19-in. clutch connected to L-R. Compressor, Class ER-1, 540 cu.ft.

Complete with starting unit; in place after less than one year's use. Will demonstrate. Will sell engine alone if desired.

HUGH DOLAN & SONS, Pottsville, Pa.

DRAW BRIDGE FOR SALE CHEAP

Superstructure and machinery for a 238 ft. complete Highway Swing Span for sale at Bargain Price. Weight 220,000 lbs. Condition perfect, location Southeast.

WANNAMAKER & WELLS, INC.
Orangeburg, S. C.

How's Your POCKETBOOK?

By our liberal 3-way plan you CAN afford to operate Brand New

PULSOMETER

STEAM PUMPS

The idea is simple:

1. **Rental**
2. **Rental Purchase**
3. **Deferred Payments**

Yes—we have used Pumps on hand, occasionally. Write for details.

Pulsometer Steam Pump Co.
221 W. 41st St., New York City

SATISFACTION

ALBERT PIPE SUPPLY CO., INC.

NEW-RECLAIMED-USED

PIPE

SERVICE — PRICES

ALL SIZES CUT TO SKETCH AND STOCKED

BERRY & NORTH 13th STS. BROOKLYN, N.Y.

GUARANTEED

PIPE SECOND HAND

With new threads and couplings; also cut to sketch.

PFAFF & KENDALL
96 Waydell St., Newark, N. J.

FOR SALE OR RENT

1—Mod. 4 Northwest Crane, 1 yd. bucket.
1—Type B, High Lift, Cat. Erie St'm Shvl.
1—Model 21 Parsons Ditcher. Will rent.
1—7-S Ransome Mixer.
1—Austin Mammoth Senior Rip Snorter Leaning Wheel Grader, with Scarifier.
2—2-ton Caterpillar Tractors.

A. STRYKER, INC.
2053 S. Broad Street, Trenton, N. J.

DIESEL OIL ENGINES

420 H.P.

24—Busch-Sulzer 6 cylinder, 4 cycle, 14¼-in.x 14½-in., 327 r.p.m., complete auxiliary equipment.

Slightly used, thoroughly shop reconditioned with running test before shipment.

Wire, Phone or Write

A. G. SCHOONMAKER & SONS, Inc.
30 Church St., New York City
Phone—Cortlandt 4306

FOR SALE

100—50 Tons Capacity

All Steel Hopper Dump Ore Cars

In Splendid Condition
Lowest price in years.

DULUTH IRON & METAL CO.
Duluth, Minn.

Notice To Advertisers!

Owing to the Holiday, New Year's Day, Jan 1st, the *"Searchlight"* pages of Jan. 1st issue of

ENGINEERING NEWS-RECORD

will close one day in advance of the regular schedule.

Advertisers' cooperation in sending new advertisements or changes of copy early will be appreciated.

Final Closing Time

Display Ads 10 A.M. Monday, Dec. 29th.

Proposals 10 A.M. Tuesday, Dec. 30th.

Directory of Engineers

New England

Connecticut

Beugler, Edwin J.
Consulting Engineer
Railways, Water Power
Foundations
Examinations and Reports.
Cheshire, Conn., Tel. 205

Massachusetts

Barbour, Frank A.
M. Am. Soc. C.E.
Water Supply, Water Purification, Sewerage and Sewage Disposal.
Boston, Mass., Tremont Bldg.

Chas. T. Main, Inc.
Engineers
Industrial Buildings
Electrical\ Steam and Hydraulic Power
Valuations and Reports—
Consulting Engineering
201 Devonshire St., Boston, Mass.

Metcalf & Eddy
Engineers
Harrison P. Eddy
Charles W. Sherman
Almon L. Fales
Frank A. Marston
John P. Wentworth
Harrison P. Eddy, Jr.
Arthur L. Shaw
E. Sherman Chase
Members, Am. Soc. C.E.
Water, Sewage, Drainage, Refuse and Industrial Wastes Problems Laboratory
Boston, Statler Building

Howard M. Turner
Consulting Engineer
Investigations, Valuations, Plans, Supervision of Construction — Water Power, Water supply, Public Utilities.
12 Pearl St., Boston

Vaughan Engineers
John F. Vaughan
Design and Supervision
Hydraulic and Electrical
Steam and Structural
Industrials & Public Utilities
Investigations and Reports.
Boston, Mass., 44 School St.

Rhode Island

Walter H. Snell
Timber Engineer
Wood Technology, Wood Decay and Wood Preservation.
Brown University,
Providence, R. I.

New York

Ash-Howard-Needles & Tammen
Consulting Engineers
BRIDGES and STRUCTURES
New York, N. Y., 55 Liberty St.
Kansas City, Mo., 1013 Baltimore Ave.

New York

Allied Engineers, Inc.
Engineers and Constructors
120 WALL ST.,
NEW YORK
Birmingham, Ala.
Jackson, Mich.

Barker & Wheeler
Water Supply — Sewerage — Sewage Disposal — Power Systems
Utility and Industrial Valuations Reports
New York City, 11 Park Place
Albany, N. Y., 36 State St.

Maurice Blumenthal & Asso. Eng. & Con.
Pile Foundations, Difficult Underpinning, Designers and Builders of Vehicular Tunnels, Toll Bridges, Transit R. R. Tunnels, Caisson, Concrete.
55 West 42nd Street, New York City

Thomas F. Bowe
Consulting Engineer
James M. Kingsley—John G. Albertson
Reports — Valuation — Designs — Supervision
Water Sewerage — Sewage Treatment — Refuse Disposal — Industrial Wastes
New York, 110 William Street.

Caird, James M.
Chemist and Bacteriologist
Expert Testimony; Examinations and Reports upon Proposed Sources of Water Supplies; Tests and Supervision of Filter Plants; Copper Sulphate Treatments for Algae; Sterilization Treatments; Sanitary Investigations, Including Typhoid Fever.
Cannon Building, Broadway and Second St., Troy, N. Y.

City-Wastes Disposal Co.
Specialists in Drainage, Sewerage and Sewage Disposal.
Reports and Estimates, Surveys, Plans and Supervision.
New York, 45 Seventh Avenue

Cleveland, H. Burdett
Consulting Sanitary Engineer, Water Supply and Purification, Sewerage and Sewage Disposal, Refuse Disposal, Industrial, Waste Treatment, Investigation, Design, Supervision of Construction.
New York, 225 Broadway.

Concrete-Steel Engineering Co.
Designing and Supervising Engineers
Concrete-Steel Bridges
New York. Park Row Bldg.

Hugh L. Cooper & Co.
General Hydraulic Engineering
Including the design, financing, construction and management of hydro-electric power plants.
New York City, 101 Park Ave.

New York

George C. Diehl, Inc.
Consulting Engineers
Sewerage—Sewage Treatment—Water Supply—Laboratory—City Planning
Buffalo, N. Y. Ellicott Square

Fowler, Charles Evan
M. Am. Soc. C. E., M. Engr. Inst. Can.
Consulting Civil Engineer
ARTISTIC BRIDGES AND STRUCTURES
New York City 25 Church St.

Ford, Bacon & Davis
Incorporated
Engineers
39 Broadway, New York
Philadelphia Chicago
San Francisco

Fuller & McClintock
Engineers
New York, 170 Broadway
Philadelphia, Pa., Pennsylvania Bldg., 15th and Chestnut Sts.
Kansas City, Mo., Walsix Bldg., 600 Walnut St.

Harris, Frederic R.
Consulting Engineer
Foundations,
Water Front Improvement,
Dry Docks, Bridges, Steel and Reinforced Concrete Structures.
Reports, Estimates, Plans and Supervision.
New York City, 10 E. 44th St.

Hazen & Everett
Allen Hazen, Chester M. Everett, L. N. Babbitt.
Consulting, Hydraulic and Sanitary Engineers
Water Supply, Sewerage, Drainage, Valuations, Supervision of Construction and Operation.
New York City, 25 W. 43rd St.

Philip W. Henry, C. E.
Consulting Engineer
Member, Am. Inst. Cons. Engrs., Am. Soc. C. E., A.I.M.E.
Reports on Properties and Management
75 West St., New York, N. Y.

Hevenor & Weller, Inc.
Civil Engineers
Municipal Engineering, Water Supply, Sewerage, Sewage Treatment, Garbage Disposal, Paving, Design, Estimates, Supervision of Construction.
Rochester, N. Y., 5 St. Paul St.

New York

Holst, J. L.
Consulting Engineer
Investigations, Reports, Design, Specifications, and Supervision of Construction of Buildings, Bridges, Tunnels, and Marine Structures.
New York City, 420 Lexington Avenue

Hopkins, Charles G.
Consulting Engineer
Water Supply, Sewerage Wastes Disposal, Municipal Engineering, Expert Testimony, Appraisals.
Rochester, N. Y., 349 Cutler Building.

Hill, Nicholas S., Jr.
Consulting Engineer
Water Supply—Sewage Disposal—Hydraulic Development.
Reports — Valuations — Design — Operation — Investigations — Management — Construction — Rates
Chemical and Biological Laboratories
New York City, 112 E. 19th St.

Horton, Robert E.
Mem. Inst. C.E., Mem. Am. Soc. C.E.
Consulting Hydraulic Engineer
Reports, Estimates, Design and Construction for Water Power, Water Supply, Storage, Flood Control, Irrigation and Drainage. Specialist in Hydraulic and Hydrologic Problems.
Telephone and telegraph address: Phone 6-12 F-23, Albany, N. Y. Mail address and laboratory, Voorheesville, N. Y.

Walter Kidde Constructors
Incorporated
Engineers and Builders
Business established 1900
Inspections — Reports — Design — Construction — Industrial Plants — Wharfs and Piers — Power Plants — Chemical Works
New York City, 140 Cedar St.

Lee, William S.
M.Am. Soc. C.E.; M. Am. Soc.M.E.
M. Eng. Inst. Can.
Fellow Am. Inst. E. E.
Consulting Engineer
New York City, 535 Fifth Ave.
Charlotte, North Carolina.

Lockwood Greene Engineers, Inc.
Engineers
Plans—specifications—Reports—Appraisals—for Industrial Plants.
New York—Boston—Chicago—Cleveland—Spartanburg.

Mead, Daniel W. Scheidenhelm, F. W.
Consulting Engineers
Hydro-electric Developments, Water Supply, Irrigation, Drainage, Flood Control.
New York, 50 Church St.

J. C. Meem
Civil Engineer
M. Am. Soc. C. E.
Design of Methods, Supervision of Operation, Subways, Heavy Underpinning, Foundations, Soft Ground and Trench Tunnels.
149 Rensen St., Brooklyn, N. Y.

Directory of Engineers

New York

Ralph Modjeski

M. Am. Soc. C. E.
M. British Inst. C. E.
M.E.I.C.

Consulting Engineer

BRIDGES

New York, 121 East 38th St.
Chicago, 310 South Michigan Blvd.

Meyer, Strong & Jones, Inc.

Power Plants—Mechanical and Electrical Equipment—Heating and Ventilating.

New York City, 101 Park Ave.

Moran & Proctor

Consulting Engineers

Foundations for buildings, bridges, dams, and all other sub-structure work. Designs and supervision.

New York City, 342 Madison Ave.

O'Rourke, John F.

Consulting Engineer

Designs, Estimates and Patent Rights for Railway and Vehicular Tunnels.

17 Battery Place, New York

Malcolm Pirnie

Engineer

Malcolm Pirnie Charles F. Ruff

Water Supply, Treatment, Sewerage
Reports, Plans, Estimates,
Supervision and Operation.
Valuation and Rates.

25 W. 43rd St., New York, N.Y.

The Pitometer Company

Engineers

Water Waste Surveys
Trunk Main Surveys
Water Distribution Studies
Penstock Gaugings.

New York, 50 Church St.

Potter, Alexander

Consulting Engineer

Hydraulics, Sanitation, Concrete Structures. Tel. 3195 Cortlandt
New York, 50 Church Street.

Potts, Clyde

M. Am. Soc. C. E.
Consulting Sanitary Engineer

Sewerage and Sewage Disposal, Water Works and Water Supply Reports, Plans and Estimates

New York, 30 Church St.

Sanborn & Bogert

Consulting Engineers

Water-Supply, Sewerage, Tunnels and Foundations. Concrete Structures.

New York 30 Church St

New York

Robinson and Steinman

H. D. Robinson
D. B. Steinman

Consulting Engineers

Bridges:

Design, Construction, Strengthening, Investigations, Reports, Advisory Service.

New York, 117 Liberty St.

Scharf, H. W.

Engineer

Light, Heat and Power for Buildings, Industrials, Utilities, Design, Construction, Reports, Valuations

New York, 1540 Broadway
Telephone Bryant 9573

Sanderson & Porter

Engineers

for the Financing, Reorganization, Design, Construction of Industrials and Public Utilities.

Chicago New York San Francisco

Allen N. Spooner & Son, Inc.

Contracting Engineers

River and Harbor Construction, Piers, Pier Sheds, Bulkheads, Foundations, Reinforced Concrete, Bridges, Caissons, Subaqueous Pipe and Cable Laying, Marine Salvaging, Divers and Special Dredging.

New York, Pier 11, North River

Seelye, Elwyn E., Inc.

Consulting Engineers
for
The Strength of Structures

101 Park Ave., New York City.

Stillman & VanSiclen, Inc.

Chemical and Highway Engineers

ROADS and PAVEMENTS

Analyses and Tests of Asphalt Paving Materials, Bitumens, Road Oils, Cement and Concrete. Plant and Street Inspection Service Furnished. Specifications and Plans Drafted and Improved. Full Equipment for Making Standard Core Borings. Experts in Investigations and Litigations. Bidders' Samples Examined for Compliance with Specifications.

227 Front Street, New York

Taylor, Henry W.

Consulting Engineer

Water Supply, Sewerage, Hydraulic Developments.

New York City, 11 Park Place

Thomson, T. Kennard

Consulting Engineer

Foundations, Buildings, Bridges, Water Power,
Borings and investigations.

30 Madeline Drive,
Yonkers, N. Y.

New York

The J. G. White Engineering Corporation

Engineers—Constructors

Oil Refineries and Pipe Lines, Steam and Water Power Plants, Transmission Systems, Hotels, Apartments, Office and Industrial Buildings, Railroads.

Reports and Appraisals.

New York 43 Exchange Place

Vermeule, Cornelius C.

Consulting & Designing Engineer

Water Supply, Sewerage.
Water & Steam Power Plants.
Reports, Valuations.

New York 38 Park Row

Waddell & Hardesty

Consulting Engineers

Steel and Reinforced Concrete Structures, Vertical Lift and Bascule Bridges, Difficult Foundations, Reports, Checking of Designs, Advisory Services, and Appraisals.

New York, 150 Broadway.

Pennsylvania

Albright & Mebus

Civil Engineers

Municipal Engineering, Sewerage, Drainage, Sewage Treatment, Water Supply, Design and Revision of Street Plans, Street Paving, Valuation, Construction.

Philadelphia, 1502 Locust St.

The J. N. Chester Engrs.

J. N. Chester D. E. Davis
J. F. La Boon J. T. Campbell
E. E. Bankson

Consulting Hydraulic, Sanitary and Valuation Engineers.

Pittsburgh, Pa., 717 Liberty Ave.

Day & Zimmermann, Inc.

Engineers

Examinations
Reports
Valuations
Management

Industrials and Utilities

New York Chicago
PHILADELPHIA
112 N. Broad St.

Franklin & Company

Consulting Engineers

Water Supply-Sewage Disposal, Town Planning.
Airport Engineering

Philadelphia, 906-7 Crozer Bldg.

Fuller, Weston E.

W. E. Fuller E. W. Doebler
Consulting Engineers

Water Works, Sewerage Works, Flood Control, Drainage, Supervision, Management, Rates, Valuation, Testing Materials.

Swarthmore, Pa. Hicks Hall

Pennsylvania

Gannett, Seelye & Fleming, Engineers, Inc.

Engineering, Appraisals, Construction, Management.

Harrisburg, Pa.
New York, N. Y.

Hunting, Davis & Dunnells

Consultants for structural engineering of building projects. Designers of mercantile buildings, warehouses and industrial plants.

Pittsburgh, Pa., 1150 Century Bldg.

Morris Knowles, Inc.

Engineers

Water Supply and Purification, Sewerage and Sewage Disposal, Valuations, Laboratory, City Planning.

Pittsburgh, Pa.

Nuebling & Mast

Consulting Engineers

EMIL L. NUEBLING
Member American Soc. C. E.
JAMES E. MAST
Civil Engineer

Civil, Hydraulic and Municipal Engineering, Surveys, Appraisals, Investigations and Reports.

524 Court St., Reading, Pennsylvania.

W. E. Moore & Co.

Engineers

Reports, Designs and Supervision of Public Service Properties. Industrial Plant Installations. Electric Furnace Design and Applications.

Pittsburgh, Pa., Union Bank Bldg.

Scofield Engineering Co.

CONSULTING ENGINEERS

Municipal Improvements.

Industrial Plants and Processes.

Design, Construction, Appraisals

PHILADELPHIA

New Jersey

Sincerbeaux, Moore & Shinn

Consulting, Designing and Supervising Civil Engineers

Surveys, Estimates, Plans, Reports, Design and Construction.

Sewerage, Water Supply, Drainage, Roads, Railways, Bridges, Coast Protection, Topographical and Title Surveys, Subdivision and Country Estate Development.

Offices:

Asbury Park, Lakewood, Manasquan, New Brunswick, Princeton, Toms River, Trenton.

John L. Weber, Inc.

Engineers

Appraisals	Dams
Investigations	Water Supplies
Reports	Sewers
Designs	Highways
Construction	Industrial Plants

Trenton, N. J., 219 East Hanover St.

Directory of Engineers

South East

Georgia

B. M. Hall & Sons
Consulting Engineers
Civil, Mining and Hydraulic
Surface and Underground Water Supply, Water Powers, Floods, Mines, Quarries, Mineral Resources.
Atlanta, Ga. Peters Bldg.

W. C. Spiker & Co.
Structural Engineers
Members: Amer. Soc. C. E.; American Concrete Institute and Amer. Soc. for Testing Materials.
910 McGlawan-Bowen Bldg., Atlanta, Ga.

South West

California

Rosewater, W. M.
Assoc. M. Am. Soc. C. E.
Consulting and Designing Engr.
Specializing on Harbor and Mining Dredges, Acid Phosphate Fertilizer Plants, c/o Windsor Apt. Hotel, West 7th St. at Catalina, Los Angeles, Calif.

Middle East

Tennessee

The Morgan Engineering Companies
Hydraulic Engineers
Flood Prevention—Irrigation—Drainage—Power Development.
Memphis. Dayton.

East North Central

Illinois

Alvord, Burdick & Howson
John W. Alvord, Charles B. Burdick
Louis R. Howson, Donald H. Maxwell
Consulting Engineers

Water Works	Sewerage
Water Purification	Sewage Treatment
Flood Relief	Power Generation
Drainage	Appraisals

Civic Opera Building—Chicago

Battey & Kipp
Incorporated—*Engineers*
Design and Construction. Complete Industrial Plants, Power Plants and Electrical Installations. Engineering Reports, Analyses and Appraisals.
Chicago, 231 S. La Salle St.

Murray Blanchard
M. Am. Soc. C.E.
Civil Engineer. Consultant.
Hydraulic and Water Power Investigations. River and Harbor Improvements, Flood Control, Dams, Foundations, Tunnels.
200 Engineering Building, Chicago.

East North Central

Illinois

Byllesby Engineering & Management Corp.
Chicago, 231 S. La Salle Street
New York San Francisco
Detroit, Mich.

Condron & Post
Theodore L. Condron, M. Am. Soc. C. E.
Chester L. Post, M. Soc. C. E.
Consulting Engineers
Bridges, Buildings, Foundation
Chicago, Monadnock Buildings.

Consoer, Older & Quinlan, Inc.
Consulting Engineers
Clifford Older
Arthur W. Consoer
George A. Quinlan
George O. Consoer
Upshur F. Turpin
Leslie I. Johnstone
John A. Fulkman
George B. Mulloy
Water Supply—Sewerage—Flood Control & Drainage—Bridges—Ornamental Street Lighting—Paving—Industrial Engineering.
Chicago Engineering Building
Branch Offices: St. Louis, Mo., and Madison, Wis.

Gordon & Bulot *Engineers*
Successors to Maury & Gordon
Water Supply and Purification
Sewerage and Sewage Disposal
Design
Appraisals
Reports
Chicago, 53 W. Jackson Blvd.

Hammond, Alonzo J.
Consulting Engineer
General Engineering practice—Bridges, railways and terminals. Properties examined for financing. Hydro-electric. Buildings. Construction.
120 So. LaSalle St., Chicago, Ill.

Harza Engineering Co.
Consulting Engineers
Dams, Hydraulic, Hydro-Electric, Flood Control and Sanitary Projects.
20 N. Wacker Drive, Chicago.

Pearse, Greeley & Hansen
Hydraulic & Sanitary Engineers
Reports, Designs, Supervision Appraisals. Water Supply, Sewerage. Water Purification, Sewage Treatment. Refuse Disposal.
Chicago, Ill., 6 N. Michigan Ave.

East North Central

Illinois

Randolph-Perkins Co.
Consulting Engineers
Water Supply,
Sewerage,
Sewage Disposal,
Street Lighting,
Excavation Specialists.
Chicago, 31 S. Clark St.

The Scherzer Rolling Lift Bridge Company
Engineers
Movable Bridges
Fixed Bridges
Monadnock Block, Chicago

Smetters, Samuel T.
Consulting Engineer
Reports and Constructive criticism made on Movable Bridges, Movable Dams, Canal Locks, and Heavy Machinery. Personal service rendered. Member: Am. Soc. C.E., Am. Soc. M.E., Western Soc. of E.
1556 East 61st St., Chicago, Ill.

Strauss Engineering Corporation
Consulting Engineers
Movable and Fixed Bridges, Specialists in Trunnion Bascule and Direct Lift Bridges.
Chicago, 307 N. Michigan Ave.

Stern, I. F.
Consulting Engineer
Bridges, Buildings and other Structures, Engineering Projects, Design, Supervision, Investigation, Reports, Valuations, Advisory Service.
Chicago, Ill., First Nat'l Bk. Bldg.

East North Central

Michigan

Fargo Engineering Co.
Consulting Engineers
Hydro-Electric and Steam Plants. Difficult Dam Foundations.
Jackson, Michigan.

Hubbell, Hartgering & Roth *Consulting Engineers*
Water Supply, Sewerage, Sewage Disposal and Municipal Engineering
Detroit, Mich. 2640 Buhl Bldg.

East North Central

Ohio

Barstow & McCurdy, Inc.
Civil and Sanitary Engineers
E. D. Barstow, G. E. McCurdy
A. LeFeber, W. S. Mathews
Sewerage and Sewage Disposal, Water Supply—Municipal Engineers.
Mendenhall Bldg. Akron, Ohio
American Bldg. Cincinnati, Ohio

Gascoigne, George B.
Consulting Engineer
W. L. Harens, A. A. Burger
F. W. Jones, F. C. Tulles
Sewerage and Sewage Disposal, Water Supply and Purification, Treatment of Industrial Wastes.
Cleveland. Leader Building

H. P. Jones & Company
Engineers
Harvey P. Jones, E. I. Roberts
George N. Schoonmaker, B. M. Batch
Sewerage, Sewage Treatment and Water Supply.
Second National Bank Building, Toledo, Ohio.

Indiana

Charles H. Hurd
Consulting Engineer
Water Supply and Purification. Sewerage and Sewage Disposal Treatment of Industrial Wastes.
518 No. Delaware St., Indianapolis

Louisiana

Billingsley, James W.
Preliminary Investigations, Detailed Plans, and Construction Supervision. For Industrial Developments, Docks, Roads, Bridges, Drainage and Municipal Improvements.
New Orleans, Louisiana.

Minnesota

Turner, C. A. P.
Consulting Engineer
M. Am. Soc. C. E., Reinforced Concrete and Structural Steel Bridges, Builders and Manufacturing Plants.
Minneapolis, Minn., 300 Builders Exchange Bldg.

Wheeler, Walter H.
Designing and Cons. Engineer
Investigations, Reports, Plans, Specifications, Supervision of Construction, Valuations. For Bridges, Buildings, Dams, Mfg. Plants, etc. Minneapolis, Minn., Met. Life Bldg.

Missouri

Burns & McDonnell Eng. Co. McDonnell-Smith-Baldwin-Lambert
Consulting Engineers
Waterworks, Sewerage, Lighting, Appraisals, Rate Investigations. Kansas City, Mo., Interstate Bldg., Los Angeles, Cal. Western Pacific Bldg.

Clark E. Jacoby Engineering Co.
Engineers
Reports, Estimates, Valuations, Investigations, Plans, Surveys, Supervisions of Construction.
101 W. Eleventh St., Kansas City, Mo.
650 E. Big Bend Blvd., St. Louis, Mo.

Directory of Engineers

North Central

Missouri

Mullergren, Arthur L.
Consulting Engineer
Specialist in Electric Light, Power and Water Pumping. Kansas City, Mo., 555 Gates Building.
St. Louis, Mo.

Sverdrup & Parcel
Consulting Engineers
Bridges, Structures, Foundations and Reports
2021 Railway Exchange Bldg.

Black & Veatch
Consulting Engineers
Sewerage, Sewage Disposal, Water Supply, Water Purification, Electric Lighting, Power plants, Valuations, Special Investigations, Reports and Laboratory Service.
E. B. Black N. T. Veatch, Jr.
A. P. Learned J. F. Brown
E. H. Dunmire F. M. Veatch
Kansas City, Mo., Mutual Bldg. Los Angeles, Calif., 307 South Hills St. New York City, 230 Park Ave.

When Consulting Service is needed—
over 30,000 readers of Engineering News-Record know of this Directory of Engineers as a source for quickly locating competent advisors. Is *your name* listed here?

Wisconsin

Federal Engineering Co.
Civil & Architectural Engineers
Designers and Superintendents Buildings and Industrial Plants. Milwaukee, Wis. 218 - 219 Stephenson Building.

Hatton, T. Chalkley
Consulting Sanitary Engineer.
Advice given on Design and Operation of Sewage Disposal Works, and Formation and Operation of Metropolitan sewerage and Water Districts.
490 Broadway, Milwaukee, Wisconsin.

Canada

Ontario

James, Proctor & Redfern, Limited
Consulting Engineers
Municipal Engineering
Bridges, Buildings and other structures, design, supervision, investigation reports, valuations.
36 Toronto St. Toronto 2

Vancouver

Muckleston, H. B.
Consulting Engineer
Irrigation, Power Water Supply and Purification, Sewerage and Sewage Disposal, Reports, Estimates, Valuations and Appraisals.
Vancouver, B.C., 901 Rogers Bldg.

Inspecting and Testing Engineers

Gulick-Henderson Co.
INSPECTION AND TESTING
New York Pittsburgh
Chicago St. Louis
Dusseldorf, Germany

Robert W. Hunt Company
Engineers
Inspection—Tests—Consultation
General Office
Insurance Exchange—Chicago
Branch Offices all large Cities

New York Testing Laboratories *Chemical & Physical Tests, Microscopical Examinations*
Electrical Tests, Power Plant Tests, Expert Inspections Cities and Industries. New York City.
80 Washington St.

Pittsburgh Testing Laboratory
Pittsburgh, Penna.
—Analysis . Inspection . Testing Research
Branch Offices in the Principal Cities

Schools and Colleges

Norwich University
(Founded 1819)
The Military College of Vermont. Academic Courses in Civil and Electrical Engineering. Address Prof. H. R. Roberts.
Northfield, Vermont.

Engineering Colleges
offering resident courses are conveniently located to serve practically all sections of the country.
For information write the Professional Service Section of E.N.R.

Professional Services

Saving money on construction work is largely a matter of knowing the best method of handling the particular job in hand! The wide and varied knowledge of a consulting engineer will aid you considerably on your difficult construction problems with a saving that more than justifies his services. Consult this directory of Engineers!

These Testing Laboratories . . .

are ready to help you solve your analytical and technical problems—to help you get greater efficiency with lower costs.

Consult the advertisements here for the kind of consulting service you need.

▸ ▸ ENGINEERING Schools and Colleges inviting the individual and advisory consideration of readers through announcements in these pages evidence confidence in the outstanding worth of the instruction offered and merit attention accordingly.

CONSTRUCTION Market Place

This classified index of advertisers in this issue is published as a convenience to the reader. Every care is taken to make it accurate, but Engineering News-Record assumes no responsibility for errors or omissions. If you don't see all you need in the advertising section, we shall be glad to assist you. Write to—

NEWS-RECORD INFORMATION BUREAU

ENGINEERING NEWS-RECORD, *Tenth Ave. at 36th St., New York, N. Y.*

See Last Page for Alphabetical Index **See Searchlight Section for Used Equipment**

Anchor Slot (Masonry)
Universal Form Clamp Co.

Armorgrids
Blaw-Knox Co.
Dravo-Doyle Company
Hendrick Mfg. Company
Tri-Lok Company

Ash Handling Machinery
Barber-Greene Co.
Haiss Mfg. Co., Geo.

Asphalt
Standard Oil Co. of N. Y.
Texas Company

Asphalt Blocks
Hastings Pavement Co.

Back-Fillers
Austin Mchy. Corp.
Buckeye Tr. Ditcher Co.
Harnischfeger Corp.
Moore Trench Mach. Co.

Bar Benders and Cutters
Ryerson & Son, Inc., Jos. T.

Bar Chairs, Reinforcing
Universal Form Clamp Co.

Barges, Concrete and Steel
American Bridge Co.
Federal Shipbldg. & Dry Dock Co.

Bars, Iron & Steel
Bethlehem Steel Co.
Carnegie Steel Company
Illinois Steel Company
Jones & Laughlin Steel Corp.
Rail Steel Bar Assn.
Ryerson & Son, Inc., Jos. T.

Batch Boxes
Blaw-Knox Co.
Erie Steel Constr. Co.
Lakewood Engrg. Company

Batchers, Adjustable Measuring
Blaw-Knox Co.
Erie Steel Constr. Co.

Beams, Construction
Jones & Laughlin Steel Corp.

Bearings, Ball and Roller
Hyatt Roller Bearings Corp.
New Departure Mfg. Co.

Bins, Storage
Blaw-Knox Co.
Erie Steel Constr. Co.
Industrial Brownhoist Corp.
Lakewood Engrg. Company

Blasting Accessories
Hercules Powder Co.

Blocks & Tackle
Patterson Co., W. W.

Boilers & Boiler Settings
Abendroth & Root Mfg. Co.
American Chimney Corp.
Ballard, Sprague & Co.
Summerhays & Sons Co.

Bolts, Nuts, Nails, Rivets, Spikes, etc.
Bethlehem Steel Co.
Illinois Steel Company
Pittsburgh Screw & Bolt Corp.
Ryerson & Son, Inc., Jos. T.

Bonding Companies
(See Searchlight Section)

Books, Engineering and Technical
McGraw-Hill Book Co.

Borings, Core
Sprague & Henwood, Inc.

Brick, Bldg. & Paving
Metropolitan Paving Brick Co.

Bridge Operating Machy.
Earle Gear & Machine Co.
McKiernan-Terry Corp. (Steele & Condict, Inc.)

Bridges
American Bridge Co.
Atlantic Bridge Company
Belmont Iron Wks.
Bethlehem Steel Co.
Clinton Bridge & Iron Wks.
Earle Gear & Mch. Co.
Fort Pitt Bridge Works
Ingalls Iron Works
McKiernan-Terry Corp. (Steele & Condict Div.)
Milwaukee Bridge Co.
Mount Vernon Bridge Co.
Phoenix Bridge Co.
Pitts.-Des Moines Steel Co
Raymond Concrete Pile Co
Shoemaker Bridge Co.
Virginia Bridge & Iron Co.
Wis. Bridge & Iron Works

Bridges, Suspension
Roebling's Sons Co., John A.

Buckets, Clam Shell
Blaw-Knox Co.
Erie Steel Constr. Co.
Haiss Mfg. Co., Geo.
Hayward Co.
Industrial Brownhoist Corp.
Lakewood Engrg. Company
Owen Bucket Co.
Williams Co., G. H.

Buckets, Concrete
Lakewood Engrg. Company

Buckets, Dragline
Blaw-Knox Co.
Erie Steel Constr. Co.
Harnischfeger Corp.
Hayward Co.
Monighan Mfg. Corp.
Williams Co., G. H.

Buckets, Dredging & Excavating
Blaw-Knox Co.
Haiss Mfg. Co., Geo.
Harnischfeger Corp.
Industrial Brownhoist Corp.
Moore Trench Machine Co.
Sauerman Bros.
Williams Co., G. H.

Buckets, Elevator
(See Elevators, Buckets)

Buckets, Orange-Peel
Hayward Co.
Owen Bucket Co.

Buildings, Steel
American Bridge Co.
Belmont Iron Works
Blaw-Knox Co.
Erie Steel Constr. Co.

Cableways
American Steel & Wire Co.
Hayward Co.
Roebling's Sons Co., John A.

Cableways, Excavators
(See Excavators, Cableway)

Car Steps, Safety
(See Treads, Safety)

Cars, Air Dump, Industrial, Etc.
Bethlehem Steel Co.
Koppel Industrial Car Equip. Co.
Lakewood Engrg. Company
Ramapo Ajax Corp.
Western Wheel Scraper Co.

Carts, Concrete
Lakewood Engrg. Company

Castings, Iron and Steel
Bethlehem Steel Co.
Central Foundry Co.
Fox & Co., John
Marion Malleable Iron Wks.
Vulcan Iron Wks. of Pa.

Cement
Lehigh Portland Cement Co.
Universal Atlas Cement Co.

Cement Gun
Cement Gun Co., Inc.

Cement Making Machines
Austin Mchy. Corp.

Centers, Steel Collapsible
Blaw-Knox Co.

Chain, Steel and Malleable Sprocket
Haiss Mfg. Co., Geo.
Jeffrey Mfg. Co.
Ryerson & Son, Joseph T.

Channelers
(See Drills, Rock)

Chemicals
Hooker Electrochemical Co.

Chimneys, Concrete
Custodis Chimney Const. Co., Alphons
Kellogg Co., M. W.
Rust Engineering Co.
Summerhays Sons, Wm.
Weber Chimney Co.

Chimneys, Radial Brick
American Chimney Corp.
Ballard, Sprague & Co.
Custodis Chimney Const Co., Alphons
Kellogg Co., M. W.
Rust Engineering Co.
Summerhays Sons, Wm.

Chimneys, Steel
Blaw-Knox Co.
Chicago Bridge & Iron Works
Pitts.-Des Moines Steel Co

Chlorine, Liquid
Hooker Electrochemical Co.

Chutes, Concrete
Lakewood Engrg. Company

Clutches
Brown-Lipe Gear Co.

Coal and Ore Conveying Machinery
American Bridge Co.
Barber-Greene Co.
Haiss Mfg. Co., Geo.
Jeffrey Mfg. Co.

Coal Storage Systems
Haiss Mfg. Co., Geo.
Sauerman Bros.

Compositions, Anti-Corrosive
Inertol Co., Inc.

Compressors, Air, Heavy Duty
Allis-Chalmers Mfg. Co.
Gardner-Denver Co.
Ingersoll-Rand Co.
Nash Engrg. Co.
Schramm, Inc.
Sullivan Machinery Co.

Compressors, Air Portable
Gardner-Denver Co.
Ingersoll-Rand Co.
Nash Engrg. Co.
Novo Engine Company
Schramm, Inc.
Sullivan Machinery Co.

Concrete Breaking
McKiernan-Terry Corp. (Steele & Condit Div.)

Concrete Curing
Grasselli Chemical Co.

Concrete Floor Hardener
Anti-Hydro Waterproofing Co.

Concrete Making Machinery
(See Mixers)

Concrete Proportioning Equipment
Blaw-Knox Co.

Concrete Reinforcement
American Steel & Wire Co.
Carnegie Steel Company
Illinois Steel Company
Laclede Steel Co.
Rail Steel Bar Assn.
Ryerson & Son, Inc., Jos. T.

Condensers
Ingersoll-Rand Co.

Contractors
Ambursen Constr. Co.
Cement-Gun Constr. Co.
Gunite Construction Co.
Longyear Co., E. J.
National Gunite Contr. Co.
Raymond Concrete Pile Co
Spencer, White & Prentis, Inc.
Terry & Tench Co., Inc.
White Co., Arthur J.

Conveying Systems
Jeffrey Mfg. Co.
Moore Trench Machine Co.

Conveyors, Belt & Chain
Austin Western Road Machinery Co.
Barber-Greene Co.
Haiss Mfg. Co., Geo.
Industrial Brownhoist Corp.
Jeffrey Mfg. Co.
Smith Engrg. Works

Conveyors, Bucket
Barber-Greene Co.
Haiss Mfg. Co., Geo.
Industrial Brownhoist Corp.
Jeffrey Mfg. Co.

Cranes, Crawler, Gas, Electric and Diesel
American Hoist & Derrick Co.
Austin Mchy. Corp.
Buckeye Trac. Ditcher Co.
Dayton Whirley Co.
Harnischfeger Corp.
Ohio Power Shovel Co.
Poor, Inc., Frederic H.
Speeder Machinery Corp.
Thew Shovel Co.
Universal Crane Co.

Cranes, Locomotive
(See also Cranes, Crawler)
American Hoist & Derrick Co.
Bucyrus-Erie Company
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Motor Truck
Buckeye Tract. Ditch. Co.
Harnischfeger Corp.
Universal Crane Co.

Cranes, Overhead
Erie Steel Constr. Co.
Harnischfeger Corp.

Cranes, Tractor Mounted
Poor, Inc., Frederic H.

Cranes, Wrecking
Industrial Brownhoist Corp.

Crawler Attachments
Haiss Mfg. Co., Geo.
Trucktor Corporation

Crawlers, Rear Type
Riddell Company, W. A.
Trucktor Corporation

Creosoted Blocks, Timber Poles, Cross-Arms, Lumber, Etc.
Ayer & Lord Tie Co.
Brown Wood Preserving Co.
Jennison Wright Co.
Southern Wood Preserving Co.
Wyckoff Pipe & Creo. Co.

Creosoting
American Creosote Wks.
Ayer & Lord Tie Co.
Brown Wood Preserving Co.
Jennison-Wright Co.
Savannah Creosoting Co.
Wyckoff Pipe & Creo. Co.

Crushers and Pulverizers
Allis-Chalmers Mfg. Co.
Jeffrey Mfg. Co.
Smith Engrg. Works
Universal Crusher Co.

Culverts, Corrugated
Gohi Culvert Mfrs., Inc.
Toncan Culvert Mfr's. Ass'n.

Culverts, Metal
American Rolling Mill Co.
Gohi Culvert Mfgrs., Inc.
Toncan Culvert Mfr's. Ass'n.

Dams
Ambursen Construction Co.

Dam Proofing
American Asphalt Grouting Co.
Dravo Contracting Co.

Dealers, Equipment
(See Searchlight Section)

Deformeters
Southwark Fdry. & Mch. Co.

Derricks and Derrick Fittings
American Hoist & Derrick Co.
American Terry Derrick Co.
Dayton-Whirley Co.
Haiss Mfg. Co., Geo.
Harnischfeger Corp.
Hayward Co.
Lakeside Bridge & Steel Co.

Diggers, Trench & Clay
Ingersoll-Rand Co.

Distributors, Pressure Oil
(See Road Oilers, Pressure)

Ditching Machinery
(See Excavators)

Docks and Harbor Work
Raymond Concrete Pile Co.
Snare Corp., Fred'k.

Drafting Machines
Universal Drafting Machine Co.

Drafting Room Furniture and Supplies
Dietzgen Co., Eugene
Hamilton Mfg. Co.
Weber Co., Inc., F.

Draglines
(See Excavators, Dragline)

Drain Pipe
(See Culverts)

Drawing Materials
Dietzgen Co., Eugene
Hamilton Mfg. Co.

Drawing Tables
(See Tables and Boards Drawing)

Dredges
Bay City Shovels, Inc.
Bucyrus-Erie Company
Hayward Co.
Morris Machine Works
Norbom Engineering Co.

Dredges, Dipper
Austin Mchy. Corp.
Bucyrus-Erie Company
Harnischfeger Corp.

Dredging and Excavating
Erie Steel Constr. Co.

Drills, Air and Electric
Ingersoll-Rand Co.

Drills, Blast Hole
Gardner-Denver Co.

Drills, Core
Ingersoll-Rand Co.
Keystone Driller Co.
Longyear Co., E. J.
McKiernan Terry Corp.
Morris Machine Works
Sprague & Henwood, Inc.
Sullivan Machinery Co.

Drills, Rock
Gardner-Denver Co.
Ingersoll-Rand Co.
Schramm, Inc.
Sullivan Machinery Co.

Drums, Holding and Counterweight
Blaw-Knox Co.
Hayward Co.

Dryers
Blaw-Knox Co.
Vulcan Iron Wks. of Pa.

Dump Bodies, Trunk
Athey Truss Wheel Co.

Elevators, Bucket
Haiss Mfg. Co., Geo.
Hendrick Mfg. Company
Industrial Brownhoist Corp.
Jeffrey Mfg. Co.
Lakewood Engrg. Company
Ohio Locomotive Crane Co.
Smith Engrg. Works

Elevators, Contractors' Material
Barber-Greene Co.
Dravo Equipment Co.
Smith Engrg. Works
Thomas Elevator Co.

Engineers
(See also Directory of Engineers)
Longyear Co., E. J.
Raymond Concrete Pile Co
Spencer, White & Prentis, Inc.
Terry & Tench Co., Inc.

Engineers and Draftmen's Instruments and Supplies
Dietzgen Co., Eugene
Gurley, W. & L. E.
Hamilton Mfg. Co.
Kern Company
Weber Co., Inc., F.

Engineers, Roofing
Amer. Cement Tile Mfg. Co.

Engines, Gasoline
Allis Chalmers Mfg. Co.
Ingersoll-Rand Co.
Le Roi Company
Minneapolis-Moline Power Impl. Co.
Novo Engine Company

Engines, High Duty Water Works
Morris Machine Works

Engines, Portable
(See Engines, Gasoline)

Excavators, Bucket
Haiss Mfg. Co., Geo.

Excavators, Cableway
Sauerman Bros.

Excavators, Ditch & Trench
American Hoist & Derrick Co.
Austin Mchy. Corp.
Barber-Greene Co.
Bay City Shovels, Inc.
Buckeye Tr. Ditcher Co.
Bucyrus-Erie Company
Harnischfeger Corp.
Indust'l Brownhoist Corp.
Monighan Mfg. Corp.
Moore Trench Mach. Co.
Ohio Power Shovel Co.
Thew Shovel Co.

Excavators, Drag-Line
Austin Mchy. Corp.
Bay City Shovels, Inc.
Blaw-Knox Company
Buckeye Traction Ditcher Co.
Bucyrus-Erie Company
Dayton Whirley Co.
Harnischfeger Corp.
Hayward Co.
Monighan Mfg. Corp.
Ohio Power Shovel Co.
Sauerman Bros.
Thew Shovel Co.
Universal Crane Co.

Expanded Metal
American Rolling Mill Co.
Ryerson & Son, Inc., Jos. T.

Fence Posts, Creosoted
Ayer & Lord Tie Co.

Filters, Water, Municipal & Industrial
Amer. Water Softener Co.
Metropolitan Paving Brick Co.
Roberts Filter Mfg. Co.
Scaife & Sons Co., Wm. B.

Finishing Machines (Road)
(See Road Finishers, Concrete)

Floor Hardener, Concrete
Alan Wood Steel Co.
Blaw-Knox Co.

Floor Plates, Steel
American Pressed Steel Co.
Blaw-Knox Co.
Carnegie Steel Company
Ryerson & Son, Inc., Jos. T.

Flooring, Bridge
Dravo-Doyle Co.

Flooring, Fireproof
Dravo-Doyle Company
Hendrick Mfg. Company
Tri-Lok Company

Floors, Asphalt Mastic
Standard Oil Co. of N. Y.
Texas Company

Floors, Wood Block
Jennison-Wright Co.
Southern Wood Preserving Co.

Flumes, Iron and Steel
American Rolling Mill Co.
Blaw-Knox Co.
Gohi Culvert Mfgrs., Inc.

Forgings
Bethlehem Steel Co.
Carnegie Steel Company

Form Clamps and Tighteners
Marion Malleable Ir. Wks
Universal Form Clamp Co.

Forms—Culvert, Sewer, Tunnel, Etc.
Blaw-Knox Co.

Forms, Curb and Gutter
Blaw-Knox Co.
Lakewood Engrg. Company

Forms, Road
Blaw-Knox Co.

Forms for Walls, Building Construction, Etc.
(See Concrete Floor Hardener)

Foundations
Foundation Co.
Longyear Co., E. J.
Raymond Concrete Pile Co
Spencer, White & Prentis, Inc.
Underpinning & Foundation Co.

Frogs and Switches, Railway
Bethlehem Steel Co.
Ramapo Ajax Corp.

Furnaces, Annealing and Tempering
American Bridge Co.

Gates, Clam Shell
Haiss Mfg. Co., Geo.

Gates, Flood & Sluice
Newport News Shipbldg. & Dry Dock Co.

Gates, Hopper
Haiss Mfg. Co., Geo.

Gauges, Loss of Head
Simplex Valve & Meter Co

Gauges, Rate of Flow
Simplex Valve & Meter Co.

Gauges, Recording Pressure and Vacuum
Bristol Co.

Gauges, Water Level
Bristol Co.

Gears
De Laval Steam Turbine Co.
Earle Gear & Mach. Co.
Haiss Mfg. Co., Geo.

Generators, Electric
Allis-Chalmers Mfg. Co.

Graders, Motor
Riddell Co., W. A.
Wehr Company

Graders, Tractor Drawn
Blaw-Knox Co.
Riddell Company, W. A.
Wehr Company

Graphite
Dixon Crucible Co., Joseph

Gratings, Flooring
Blaw-Knox Co.
Dravo-Doyle Company
Hendrick Mfg. Company
Tri-Lok Company

Gravel-Washing Plants
Jeffrey Mfg. Co.
Sauerman Bros.

Grills
Dravo-Doyle Company
Tri-Lok Company

Grinders, Air & Electric
Independent Pneumatic Tool Co.

Grouting
Amer. Asphalt Grout'g Co.
Dravo Contracting Co.

Gunite Construction
Cement-Gun Co., Inc.
Cement-Gun Constr. Co.
Gunite Construction Co.
Nat'l Gunite Contr. Co.
Rust Engr. Co.
White Co., Arthur J.

Hammers, Pneumatic
(See Tools, Pneumatic)

Hammers, Steam, Pile
(See Pile Hammers, Steam)

Hangers
American Bridge Co.

Highway Crossings
Truscon Steel Company

Hoists, Caisson
Thomas Elevator Co.

Hoists, Contractors'—Electric
Allis-Chalmers Mfg. Co.
American Hoist & Derrick Co.
Bay City Shovels, Inc.
Harnischfeger Corp.
McKiernan-Terry Corp.
(Nat'l Hoist Eng. Div.)
Thomas Elevator Co.
Vulcan Iron Wks. of Pa.

Hoists, Contractors'—Gasoline
American Hoist & Derrick Co.
Harnischfeger Corp.
McKiernan-Terry Corp.
(Nat'l Hoist Eng. Div.)
Monighan Mfg. Corp.
Novo Engine Company
Thomas Elevator Co.
Vulcan Iron Wks. of Pa

Hoists, Contractors' Steam
Allis-Chalmers Mfg. Co.
American Hoist & Derrick Co.
Ingersoll-Rand Co.
McKiernan-Terry Corp.
(Nat'l Hoist Eng. Div.)
Vulcan Iron Wks. of Pa.

Hoists, Gates
Newport News Shipbldg. & Dry Dock Co.

Hoists, Hand
Harnischfeger Corp.

Hoists, Material Tower
Dravo Equipment Co.
Lakewood Engrg. Company

Hoists, Pneumatic
Gardner-Denver Co.
Ingersoll-Rand Co.
Sullivan Machine Co.

Hoppers, Concrete and Steel
(See Bins, Storage)

Hose, Air, Water and Steam
Gardner-Denver Co.

Hydrants
Michigan Valve & Fdry. Co.

Hydrotite
Hydraulic Developm't Co.

Instruments, Surveying
(See Transits and Levels)

Inspecting Laboratories
(See Directory of Engineers)

Inundators For Constant Concrete
(See Concrete Proportioning Equipment)

Joints, Filler Paving
Standard Oil Co., of N. Y
Texas Company

Joints, Flexible Pipe
(See Pipe Joints)

Kilns, Rotary and Vertical
Vulcan Iron Wks. of Pa.

Ladder Steps, Steel
Blaw-Knox Company
Hendrick Mfg. Company

Lath, Expanded Metal
(See Expanded Metal)

Leadite
Leadite Co. Inc.

Lead Pencils
Dixon Crucible Co., Joseph

Loaders, Portable
Austin Mchy. Corp.
Barber-Greene Co.

Locomotives, Compressed Air
Porter Co., H. K.

Locomotives, Electric
Jeffrey Mfg. Co.
Porter Company, H. K.
Vulcan Iron Wks. of Pa.

Locomotives, Gasoline
Midwest Locomotive Wks
Porter Company, H. K.
Vulcan Iron Wks. of Pa.

Locomotives, Steam
Koppel Indust. Car & Equip. Co.
Porter Co., H. K.
Vulcan Iron Wks. of Pa.

Locomotives, Storage Battery
Jeffrey Mfg. Co.
Vulcan Iron Wks. of Pa.

Lubricants
Dixon Crucible Co., Joseph
Texas Company

Lumber
Brown Wood Preserving Co.

Manometers
Simplex Valve & Meter Co

Metals, Perforated
Hendrick Mfg. Company

Meters, Boiler Feed Water
Builders Iron Fdy.

Meters, Current
Gurley, W. & L. E.

Meters, Gas and Steam
Builders Iron Fdy.

Meters, Water and Oil
Builders Iron Fdy.
Neptune Meter Co.
Simplex Valve & Meter Co.

Mixers, Concrete
Austin Mchy. Corp.
Cement Gun Co., Inc.
Lakewood Engrg. Company
Transit Mixers, Inc.

Mortar
Universal Atlas Cement Co.

Motors, Electric
Allis-Chalmers Mfg. Co.

Motors, Gasoline
(See Engines, Gasoline)

Motors, Portable
Haiss Mfg. Co., Geo.

Paints, Graphite
Dixon Crucible Co., Joseph

Paints, Metal Protective
Dixon Crucible Co., Joseph
Inertol Co., Inc.
National Lead Company

Paints, Waterproofing
Inertol Co., Inc.

Pavement Breakers
Gardner-Denver Co.
Ingersoll-Rand Co.
Schramm, Inc.

Paving Asphalt
(See Asphalt)

Paving Blocks, Asphalt
Hastings Pavement Co.

Paving Blocks, Wood
(See Creosoted Blocks, Timber, Poles, Cross Arms, Lumber, etc.)

Paving, Brick
(See Brick)

Paving, Cold Patching
Standard Oil Co., of N. Y.
Texas Company

Penstocks
Blaw-Knox Co.
Chicago Bridge & Iron Wks
Newport News Shipbldg. & Dry Dock Co.
Pitts.-Des Moines Steel Co.
Taylor Forge & Pipe Wks.

Pile Drivers
Dayton-Whirley Company
Harnischfeger Corp.
Industrial Brownhoist Corp.
McKiernan Terry Corp.
Vulcan Iron Wks. Chicago

Pile Extractors
McKiernan Terry Corp.
Vulcan Iron Wks. Chicago

Pile Hammers, Steam and Air
Industrial Brownhoist Corp.
McKiernan Terry Corp.
Vulcan Iron Wks., Chicago

Piles, Concrete
Raymond Concrete Pile Co
Spencer, White & Prentis, Inc.

Piles, Creosoted, Wood
American Creosoting Co.
Ayer & Lord Tie Co.
Jennison-Wright Co.
Southern Wood Preserving

Piling, Interlocking Steel
Bethlehem Steel Co.
Carnegie Steel Company
Spencer, White & Prentis, Inc.

Pipe, Bends
East Jersey Pipe Co.

Pipe, Cast Iron
Fox & Co., John
Lynchburg Foundry Co.

Pipe, Cement-Lined
Cement Lined Pipe Co.

Pipe Coatings and Waterproofing
Wyckoff & Son Co., A.

Pipe, Corrugated
(See Culverts)

Pipe, Drain
Gohi Culvert Mfgrs., Inc.

Pipe Fittings
Builders Iron Fdy.

Pipe, Forge and Hammer Welded
Taylor Forge & Pipe Wks.

Pipe, Joint Compounds and Materials
Hydraulic Development Co.
Leadite Co., Inc.
Pacific Flush Tank Co.
Presstite Engrg. Company

Pipe Joint, Flexible
Central Foundry Co.

Pipe, Lock Bar
East Jersey Pipe Co.

Pipe, Reinforced Concrete
Core Joint Concrete Pipe Co.

Pipe, Riveted Steel
Chicago Bridge & Iron Wks.
East Jersey Pipe Co.
Petroleum Iron Works Co.
Smith Corp., A. O.

Pipe, Sewer
Core Joint Concrete Pipe Co.
Gohi Culvert Mfgrs., Inc.
Laclede Christy Clay Prod. Co.
Toncan Culvert Mfr's. Ass'n.

Pipe Shoes
Marion Malleable Ir. Wks.

Pipe, Spiral
Abendroth & Root Mfg. Co.

Pipe, Welded Steel
Smith Corp., A. O.

Pipe, Wood
Redwood Mfg. Co.
Wyckoff & Son Co., A.

Plates, Steel
Amer. Pressed Steel Co.
Bethlehem Steel Co.
Carnegie Steel Company
Illinois Steel Company

Poles, Steel
Blaw-Knox Co.

Power Units, Gasoline
(See Engines)

Pressed Steel Products
Blaw-Knox Co.

Pulverizers
(See Crushers)

Pumps, Air-Lift
Ingersoll-Rand Co.
Sullivan Machinery Co.

Pumps, Boiler-Feed, Steam
Buffalo Steam Pump Co.
Cameron Steam Pump Works, A. S. (Ingersoll Rand Co.)
Frederick Iron & Steel Co.
Ingersoll-Rand Co. (Cameron Steam Pump Wks. A. S.)
Kingsford Fdry & Machine Works
Sullivan Machinery Co.

Pumps, Centrifugal and Multi-Stage High Lift
Allis-Chalmers Mfg. Co.
American Well Works
Buffalo Steam Pump Co.
Cameron Steam Pump Works, A. S. (Ingersoll Rand Co.)
De Laval Steam Turbine Co
Erie Pump & Engine Co.
Frederick Iron & Steel Co.
Gardner-Denver Co.
Ingersoll-Rand Co. (Cameron Steam Pump Wks. A. S.)
Kingsford Fdry & Machine Works
Lawrence Pump & Engine Co.
Lecourtenay Co.
Morris Machine Works
Nash Engrg. Co.
Novo Engine Company

Pumps, Contractors
Cameron Steam Pump Works, A. S. (Ingersoll Rand Co.)
Gardner-Denver Co.
Ingersoll-Rand Co. (Cameron Steam Pump Wks. A. S.)
Lawrence Pump & Engine Co.
Nash Engineering Co.
Novo Engine Company
Pulsometer Steam Pump Co.

Pumps, Deep Well
American Well Works
Lecourtenay Co.

Pumps, Dredging and Sand
Morris Machine Works
Norbom Engineering Co.

Pumps, Power
Buffalo Steam Pump Co.

Pumps, Sewage
Buffalo Steam Pump Co.
Kingsford Fdry & Machine Works
Lawrence Pump & Engine Co.
Nash Engineering Co.

Pumps, Underwriters' Centrifugal
Buffalo Steam Pump Co.

Rakes, Rack
Newport News Shipbldg. & Dry Dock Co.

Rail and Rail Joints, Fastening and Specialties
Bethlehem Steel Co.
Carnegie Steel Company

Rails, Relaying
(See Searchlight)

Railroad Ditchers
American Hoist & Derrick Co.
Bucyrus-Erie Company
Harnischfeger Corp.
Industrial Brownhoist Corp.

Recorders, Water Stage
Gurley, W. & L. E.

Refractories
Laclede Christy Clay Prod. Co.

Reinforcing, Bar Coupling
Marion Malleable Ir. Wks
Universal Form Clamp Co.

Reinforcing, Concrete
(See Concrete Reinforcement)

Reinforcing, Metal
Ryerson & Son, Inc., Jos. T.

Reinforcing Metal for Concrete Work
New Departure Mfg. Co.

Rivet Heaters, Electric
American Hoist & Derrick Co.

Riveting Hammers
Ingersoll-Rand Co.

Road Finishers, Concrete
Austin Mchy. Corp.
Blaw-Knox Co.
Lakewood Engrg. Company

Road Oils and Preservatives
Grasselli Chemical Co.
Standard Oil Co. of N. Y
Texas Company

Road Rollers, Gasoline and Steam
Buffalo-Springfield Roller
Huber Mfg. Company

Rolls, Crushing
Allis-Chalmers Mfg. Co.

Roof, Steel
Ryerson & Son, Inc., Jos. T.

Roofing, Prepared
Texas Company

Roofing, Steel
Blaw-Knox Co.

Rope, Wire-Transmission, Hoisting and Haulage
American Cable Co.
American Steel & Wire Co.
Hazard Wire Rope Co.
Leschen & Sons Rope Co
Roebling's Sons Co., John

Sash Operating Apparatus
Lord & Burnham Co.

Sash, Steel, Window
(See Window Sash)

Saw Rigs, Portable
Reed-Prentice Corp.

Scoops, Wheeled
Riddell Company, W. A.

Scrapers, Dragline
Sauerman Bros.

Scrapers, Scarifiers, Plows
Riddell Company, W. A.
Western Wheeled Scraper Co.

Screens, Revolving
Smith Engrg. Works

Screens, Sand, Gravel and Coal
Haiss Mfg. Co., Geo.
Hendrick Mfg. Company
Jeffrey Mfg. Co.

Second Hand Equipment
(See Searchlight Section)

Sewage Disposal Apparatus
Metropolitan Paving Brick Co.
Nash Engineering Co.
Pacific Flush Tank Co.

Sewer, Pipe Joints Compound
(See Pipe Joints)

Sewer Segment Blocks
(See Pipe, Sewer)

Sharpeners, Drill Steel
Gardner-Denver Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Sheaves
Haiss Mfg. Co., Geo.

Sheets, Iron & Steel
Bethlehem Steel Co.
Ryerson & Son, Inc., Jos. T.

Sheets, Roofing & Siding
American Rolling Mill Co.
Ryerson & Son, Inc., Jos. T.

Shoveling Machines
Myers-Whaley Co.

Shovels, Crawling Traction
Bucyrus-Erie Co.
Industrial Brownhoist Corp.
Ohio Power Shovel Co.
Orton Crane & Shovel Co.
Thew Shovel Company

Shovels, Creeper
Industrial Brownhoist Corp.

Shovels, Diesel and Oil
Bucyrus-Erie Company
Harnischfeger Corp.
Industrial Brownhoist Corp.
Ohio Power Shovel Co.

Shovels, Gas and Electric
American Hoist & Derrick Co.
Bucyrus-Erie Company
Harnischfeger Corp.
Industrial Brownhoist Corp.
Ohio Power Shovel Co.
Speeder Machinery Corp.
Thew Shovel Co.
Universal Crane Co.

Shovels, Steam
(See Shovels, Crawling Traction)

Shredders
Jeffrey Mfg. Co.

Skips, Stone
Lakewood Engrg. Company

Slag
Carnegie Steel Company

Snow Plows and Loaders
Frink, Carl H.
Haiss Mfg. Co., Geo.
Riddell Company, W. A.

Spreader Ballast
Bucyrus-Erie Company

Sprinklers and Sweepers, Street
Austin Mchy. Corp.

Standpipes
Chicago Bridge & Ir. Wks.
Pitts-Des Moines Steel Co.
Warren City Tank & Boiler Co.

Steam Purifiers
Blaw-Knox Company

Steel
Bethlehem Steel Co.
Carnegie Steel Company
Illinois Steel Company
Jones & Laughlin Steel Corp.
Rail Steel Bar Assn.
Ryerson & Son, Inc., Jos. T.
Toncan Culvert Mfr's. Ass'n.

Steel, Copper Bearing
Alan Wood Steel Co.

Steel Plate Construction
Blaw-Knox Co.
Chicago Bridge & Ir. Wks.
Cole Mfg. Co., R. D.
East Jersey Pipe Co.
Pitts.-Des Moines Steel Co.
Steel Plate Products Co.
Williams Co., G. H.

Steel Rock Drills
Gardner Denver Co.
Ingersoll-Rand Co.

Steel, Structural
Atlantic Bridge Company
Belmont Iron Works
Bethlehem Steel Co.
Blaw-Knox Co.
Carnegie Steel Company
Clinton Bridge Works
Erie Steel Constr. Co.
Fort Pitt Bridge Works
Illinois Steel Company
Ingalls Iron Works
Jones & Laughlin Steel Corp.
Mount Vernon Bridge Co.
Milwaukee Bridge Co.
Minneapolis-Moline Power Impl. Co.
Phoenix Bridge Co.
Pitts.-Des Moines Steel Co
Rail Steel Bar Assn.
Ryerson & Son, Inc., Jos. T.
Shoemaker Bridge Co.
Snare Corp., Frd'k.
Virginia Bridge & Iron Co
Wis. Bridge & Iron Works

Steel, Tool
Bethlehem Steel Co.
Illinois Steel Company
Ryerson & Son, Inc., Jos. T.

Stirups, Continuous Reinforcing Units
Ryerson & Son, Inc., Jos. T.

Strain Gauges
Southwark Fdry. & Mch. Co.

Structural Shapes, Steel
(See Steel, Structural)

Subgraders
(See Road Finishers, Concrete)

Tables & Board, Drawing
Dietzgen Co., Eugene
Hamilton Mfg. Co.
Weber Co., Inc., F.

Tackle Blocks
Patterson Co., W. W.

Tank Lugs
Marion Malleable Iron Works

Tanks, Air Compressor
East Jersey Pipe Co.

Tanks, Elevator Wood
Redwood Mfg. Co.

Tanks, Elevated Steel
Chicago Bridge & Ir. Wks
Cole Mfg. Co., R. D.
Pitts.-Des Moines Steel Co

Tanks, Flat-Bottom Storage
American Bridge Co.
Chicago Bridge & Ir. Wks.
Petroleum Iron Works Co.
Pitts.-Des Moines Steel Co
Steel Plate Products Co.
Warren City Tank & Boiler Co.

Tapes, Steel and Metallic
Dietzgen Co., Eugene
Hamilton Mfg. Co.
Lufkin Rule Co.
Weber Co., Inc., F.

Telemeters
Southwark Fdry. & Mch. Co.

Testing Instruments
Southwark Fdry. & Mch. Co.

Testing Machines
Southwark Fdry. & Mch. Co.

Ties, Creosoted Wood
American Creosoting Co.
Ayer & Lord Tie Co.
Jennison-Wright Co.

Ties, Steel
Carnegie Steel Company

Tile Cement Roofing
Truscon Laboratories

Timber Treated
(See Creosoting)

Tin Plate
Bethlehem Steel Co.

Tools, Pneumatic
Ingersoll-Rand Co.
Schramm, Inc.

Torches, Gasoline, Blow
Williams Co., G. H.

Torches, Welding & Cutting
(See Welding & Cutting Apparatus)

Towers, Radio and Transmission
American Bridge Co.
Blaw-Knox Co.
Newport News Shipbldg. & Dry Dock Co.

Towers, Tubular Steel
Dravo Equipment Co.
Lakewood Engrg. Company

Track, Industrial and Portable
Bethlehem Steel Co.
Carnegie Steel Company
Illinois Steel Company
Lakewood Engrg. Company
Ryerson & Son, Inc., Jos. T.

Traction, Crawling Type
Buckeye Tr. Ditcher Co.
Riddell Company, W. A.
Trucktor Corporation

Tractors
Minneapolis-Moline Power Impl. Co.

Trailers, Industrial
Williams Co., G. H.

Trailers, 3-Way Dump
Athey Truss Wheel Co.

Tramways, Overhead
Harnischfeger Corp.

Transits and Levels
Berger & Sons, C. L.
Brandis & Son
Buff & Buff Mfg. Co.
Dietzgen Co., Eugene
Gurley, W. & L. E.
Kern Company
Weber Co., Inc., F.

Transmission, Mchry. Power
Brown-Lipe Gear Co.

Treads, Safety
Blaw-Knox Company
Carnegie Steel Company
Dravo-Doyle Company
Hendrick Mfg. Company
Ryerson & Son, Inc., Jos. T.
Tri-Lok Company

Treads, Traffic Steel, Bridge
Carnegie Steel Company

Trucks, Crawler
Trucktor Corporation

Tunnel Liner Plates
Blaw-Knox Co.

Turbines, Hydraulic Impulse and Reaction
Allis-Chalmers Mfg. Co.
Newport News Shipbldg. & Dry Dock Co.

Turbines, Steam
Allis-Chalmers Mfg. Co.
DeLaval Steam Turbine Co

Turntables
American Bridge Co.
Blaw-Knox Co.

Underpinning
Spencer, White & Prentis
Underpinning & Foundation Co.

Underwater Steel Cutting
Craftsweld Equip. Corp.
Merritt-Chapman & Scott Corp.

Unloaders, Car & Wagon
Haiss Mfg. Co., Geo.

Valves, Air, Water, Steam and Gas
Bristol Co.
Golden Anderson Valve Specialty Co.
Michigan Valve & Fdry. Co.
Simplex Valve & Meter Co

Valves, Angle, Check, Gate and Globe
Golden Anderson Valve Specialty Co.
Michigan Valve & Fdry. Co.
Newport News Shipbldg. & Dry Dock Co.
Simplex Valve & Meter Co

Valves, Altitude
Golden Anderson Valve Specialty Co.

Valves, Automatic
Golden Anderson Valve Specialty Co.

Valves, Control Electric
Golden Anderson Valve Specialty Co.
Michigan Valve & Fdry. Co.
Simplex Valve & Meter Co.

Valves, Float
Golden Anderson Valve Specialty Co.

Valves, Regulating
Golden Anderson Valve Specialty Co.

Valves, Return
Golden Anderson Valve Specialty Co.

Valves, Safety
Golden Anderson Valve Specialty Co.

Valves, Sluice
Michigan Valve & Fdry. Co.

Ventilators
Lord & Burnham Co.

Washers
Smith Engrg. Works

Water Main Cleaning
National Water Main Cleaning Co.

Waterproofing
Structural Waterproofing Co.

Waterproofing Compounds and Material
Anti-Hydro Waterproofing
Inertol Co., Inc.
Texas Company

Water Purifications
Hooker Electrochemical Co

Water Softeners & Purifiers
Amer. Water Softener Co
Roberts Filter Mfg. Co.

Welding & Cutting Apparatus
Blaw-Knox Co.
Ryerson & Son, Inc., Jos. T.

Welding Rods & Wire
Ryerson & Son, Inc., Jos. T.

Welding Wire
Roebling's Sons Co., John A.

Well Drilling Machinery
American Well Works

Wellpoints
Moore Trench Machine Co

Wheels, Tracklaying Type
Athey Truss Wheel Co.
Trucktor Corporation

Wire & Cable, Electrical
Roebling's Sons Co., J. A.
Simplex Wire & Cable Co.

Wire Rope
(See Rope, Wire)

Wire Rope, Fittings
American Cable Co.
American Steel & Wire Co.
Roebling's Sons Co., J. A.

Wire Rope Slings
American Cable Co.
Roebling's Sons Co., J. A.

PULSOMETER
STEAM PUMP
225 West 42nd Street, New York City, N. Y.

Only reliable products can be continuously advertised

T-RI-LOK
The latest and greatest improvement in modern heavy floor construction.
Manufactured by
THE TRI-LOK COMPANY
PITTSBURGH PENNSYLVANIA
National Distributors
DRAVO-DOYLE COMPANY
PITTSBURGH PENNSYLVANIA
DRAVO

B G
SEND THIS COUPON
attached to your letterhead, for catalog on—
☐ Belt Conveyors ☐ Ditchers
☐ Bucket Loaders ☐ Coal Loaders
☐ Snow Loaders ☐ Car Unloaders
BARBER-GREENE COMPANY
418 W. Park Avenue, Aurora, Illinois

ALPHABETICAL INDEX TO ADVERTISERS

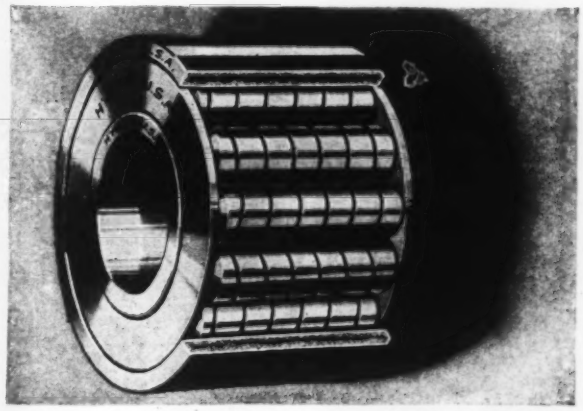
This index is published as a convenience to the reader. Every care is taken to make it accurate, but *Engineering News-Record* assume no responsibility for errors or omissions.

	Page
Abendroth & Root Mfg. Co.	76
Allis-Chalmers Mfg. Co.	36
Ambursen Construction Co.	70
Amer. Asphalt Grouting Co.	70
American Bridge Co.	80
American Cable Company	72
American Cast Iron Pipe Co.	76
American Chimney Corp.	78
American Creosote Works, Inc.	68
American Hoist & Derrick Co.	73
American Pressed Steel Co.	68
American Rolling Mill Co.	44
American Steel & Wire Co.	4
American Terry Derrick Co.	72
American Tripoli Company	71
American Water Softener Co.	74
American Well Works	75
Anti-Hydro Waterproofing Co.	70
Asociated Business Papers, Inc.	83
Athey Truss Wheel Co.	67
Atlantic Bridge Co.	80
Austin Mchry. Corp.	24
Ayer & Lord Tie Company	68
Ballard-Sprague & Co.	78
Barber-Greene Co.	103
Bay City Shovels, Inc.	72
Belmont Iron Works	80
Berger & Sons, C. L.	81
Bethlehem Steel Co.	78
Blaw-Knox Co.	21, 73
Brandis & Sons	82
Bristol Co.	74
Brown-Lipe Gear Co.	46
Brown Wood Preserving Co.	68
Buckeye Tr. Ditcher Co.	71
Bucyrus-Erie Co.	11
Buff & Buff Mfg. Co.	82
Buffalo-Springfield Roller Co.	67
Buffalo Steam Pump Company	78
Builders Iron Fdry.	75
Cameron Steam Pump Works A. S. (Ingersoll-Rand Co.)	47
Carnegie Steel Company	40
Cement-Gun Co., Inc.	71
Cement-Gun Construction Co.	81
Cement Lined Pipe Co.	75
Central Foundry Co.	76
Chicago Bridge & Iron Works	79
Clinton Bridge Works	67
Cole Mfg. Co., R. D.	79
Core Joint Concrete Pipe Co.	74
Craftswell Equip. Co.	86
Custodis Chimney Constr. Co., Alphons	78
Dayton Whirley Co.	73
De Laval Steam Turbine Co.	74
Dietzgen Company, Eugene	82
Dixon Crucible Co., Joseph	16
Dravo Contracting Co.	70
Dravo-Doyle Co.	103
Dravo Equip. Company	70
Earle Gear & Mach. Co.	80
East Jersey Pipe Co.	76
Erie Pump & Engine Works	77
Erie Steel Construction Co.	72
Fate-Root-Heath Co.	66
Federal Shipbldg. & Dry Dock Co.	64
Fort Pitt Bridge Works	78
Fox & Co., John	75
Frederick Iron & Steel Co.	78
Frink, Carl H.	66
Gardner-Denver Co.	8
Gohi Culvert Mfrs. Inc.	69
Golden-Anderson Valve Specialty Co.	77
Grasselli Chemical Co.	69
Gunite Construction Co.	70
Gurley, W. & L. E.	82
Haiss Mfg. Co., Inc., Geo.	63-72
Hamilton Mfg. Co.	81
Harnischfeger Corp.	19
Hasting Pavement Co.	66
Hayward Company	72
Hazard Wire Rope Co.	73
Headley Emulsified Prod. Co.	15
Hendrick Mfg. Company	68
Hooker Electro-Chemical Co.	74
Huber Mfg. Company	66
Hyatt Roller Bearing Co. 3rd Cover	
Hydraulic Development Corp.	75
Illinois Steel Company	10
Independent Bridge Co.	80
Industrial Brownhoist Corp.	7
Inertol Co., Inc.	45
Ingalls Iron Works Co.	79
Ingersoll-Rand Co. (Cameron Steam Pump Works, A. S.)	47
Jeffrey Mfg. Co.	5
Jennison-Wright Co. Second Cover	
Jones & Laughlin Steel Corp.	67
Kellogg Co., M. W.	78
Kern Co.	82
Kingsford Fdry. & Machine Works	77
Koppell Industrial Car Equip. Co.	67
Laclede Christy Clay Prod. Co.	74
Laclede Steel Co.	70
Lakeside Bridge & Steel Co.	73
Lakewood Engrg. Co.	28
Lawrence Pump & Engine Co.	77
Leadite Company	54
Lecourtenay Co.	77
Lehigh Portland Cement Co.	14
Le Roi Company	65
Leschen & Sons, Rope Co., A.	72
Longyear Co., E. J.	70
Lord & Burnham Co.	71
Lufkin Rule Co.	82
Lynchburg Foundry Co.	18
McGraw-Hill Book Company	74-76-79
McKiernan-Terry Corp.	29
Marion Malleable Iron Works	67
Marion Steam Shovel Co.	32
Merritt-Chapman & Scott Corp.	86
Metropolitan Paving Brick Co.	38-39
Michigan Valve & Fdry. Co.	37
Midwest Loco. Works	67
Milwaukee Bridge Co.	80
Minneapolis-Moline Power Impl. Co.	25
Monighan Mfg. Corp.	42
Moore Trench Machine Co.	20
Morris Machine Works	27
Mount Vernon Bridge Co.	80
Myers-Whaley Co.	72
Nash Engineering Co.	78
National Gunite Contracting Co.	71
National Hoisting Engine Div.	29
National Lead Company	33
Nat'l Water Main Cleaning Co.	74
Neptune Meter Co.	74
New Departure Mfg. Co.	22-23
Newport News Shipbldg. & Dry Dock Co.	26
Norbom Engineering Company	70
Nove Engine Company	73
Ohio Locomotive Crane Co.	66
Ohio Power Shovel Co.	13
Owen Bucket Co.	71
Pacific Flush Tank Co.	75
Page Engineering Co.	72
Patterson Co., W. W.	80
Pennsylvania Drilling Co.	71
Petroleum Iron Works Co.	79
Phoenix Bridge Co.	80
Pittsburgh-Des Moines Steel Co.	79
Pittsburgh Screw & Bolt Corp.	41
Plymouth Locomotive Works	66
Poor, Inc., Frederic H.	72
Porter Co., H. K.	66
Presstite Engrg. Company	74
Pulsometer Steam Pump Co.	103
Rail Steel Bar Ass'n	43
Ramapo Ajax Corp.	66
Raymond Concrete Pile Co.	2-3
Redwood Mfgrs. Co.	79
Reed-Prentice Corp.	68
Riddell Company, W. A.	66
Roberts Filter Mfg. Co.	74
Roeblings Sons Co., J. A.	30
Rust Engineering Co.	70-78
Ryerson & Son, Jos. T.	70
Safety Gas Main Stopper Co.	74
Sauerman Bros.	66
Savannah Creosoting Co., Inc.	68
Scaife & Sons Co., Wm. C.	75
Schramm, Inc.	66
Shoemaker Bridge Co.	80
Simplex Valve & Meter Co.	75
Simplex Wire & Cable Co.	72
Smith Corp., A. O.	34-35
Smith Engr. Works	12
Snare Corp., Frederick	78
Southern Wood Preserving Co.	68
Southwark Fdry. & Machine Co.	81
Speeder Machinery Corp.	72
Spencer, White & Prentis, Inc.	71
Sprague & Henwood, Inc.	70
Standard Oil Co. of New York	67
Steel Plate Products Co.	79
Steele & Condict Div.	79
Structural Waterproofing Co.	86
Sullivan Machinery Co.	77
Summerhays Sons, Wm.	78
Taylor Forge & Pipe Works	76
Terry & Tench Co.	80
Texas Company	4th Cover
Thew Shovel Co.	71
Thomas Elevator Co.	73
Toncan Culvert Mfrs. Ass'n.	31
Transit Mixers, Inc.	9
Tri-Lok Company	103
Tructor Corp.	67
Underpinning & Foundation Co.	70
Universal Atlas Cement Co.	48
Universal Crane Co.	6
Universal Crusher Co.	67
Universal Drafting Machine Co.	82
Universal Form Clamp Co.	68
Virginia Bridge & Iron Co.	80
Vulcan Iron Works, Chicago	70
Vulcan Iron Works, Pa.	66
Warren City Tank & Boiler Co.	79
Wehr Company	17
Weber Chimney Co.	78
Weber Company, Inc., F.	81
Western Wheeled Scraper Co.	66
White Co., Arthur J.	70
Whiting Corporation	72
Williams Co., G. H.	72
Wisconsin Bridge & Iron Co.	80
Wyckoff & Son Co., A.	75
Wyckoff Pipe & Creosoting Co.	68

SEARCHLIGHT SECTION

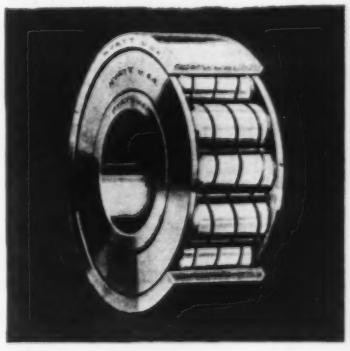
Classified Advertising

Classification	Page
BUSINESS OPPORTUNITIES	89
COMMISSARY AGENTS	
Beacon Commissary Corp.	85
CONTRACT BONDS	
Swart Associates, Inc.	87
CONTRACT WORK WANTED	
Goslin-Birmingham Mfg. Co., Inc.	89
EDUCATIONAL COURSES	
Wilson Engineering Corp.	89
EMPLOYMENT SERVICE	89
FOR RENT ADVERTISEMENTS	90
LABOR BUREAUS	
Beacon Commissary Corp.	85
POSITIONS VACANT	88
POSITIONS WANTED	88
PROPOSALS	88-89
REPRESENTATIVES AVAILABLE	89
SPECIAL SERVICES	86
SURVEYING INSTRUMENTS (USED)	90
TARPAULINS	
Globe Sales & Mfg. Co.	90
Barnett Canvas Goods & Bag Co., Inc.	90
New York Drop Cloth Mfg. Co.	90
USED and SURPLUS EQUIPMENT	90
WANTED TO PURCHASE	90
For Alphabetical Index to Used Equipment Advertisers see page	**91**
ENGINEERING SERVICE DIRECTORY	**97-100**



Hyatt Roller Bearing with outer race cut away to show distinctive and sturdy roller construction.

Hyatt Roller Bearings are everywhere, saving power, reducing maintenance and adding years of life to the equipment they protect



In gigantic cranes and rolling mill tables . . . in railroad car journals . . . in automobiles and trucks . . . in looms and spinning frames . . . in power shovels and road rollers . . . in tractors and implements . . . in material handling equipment and all kinds of machinery, as well as in the motors and the transmission equipment which drives them.

No load is too heavy, no task too severe for sturdy Hyatts. Not a demand of bearing performance . . . long life . . . freedom from care and adjustment, that Hyatt bearings do not meet and answer.

These inherent Hyatt qualities serve and safeguard performance. They prolong, as they protect, operating life. They stubbornly oppose all evils that combine to make unsatisfactory, costly operation.

Hyatts, therefore, are designed into all products with assurance that they are the better bearings and do all things well.

HYATT ROLLER BEARING COMPANY

Newark Detroit Chicago Pittsburgh Oakland

HYATT

ROLLER BEARINGS

PRODUCT OF GENERAL MOTORS

GENERAL LIBRARY
UNIV OF MICHIGAN
ANN ARBOR MICH

Buffalo, N. Y., is served by more than 1,500,000 sq. yds. of streets paved with TEXACO Asphalt.

Airview by Airmap Corporation of America, N. Y.

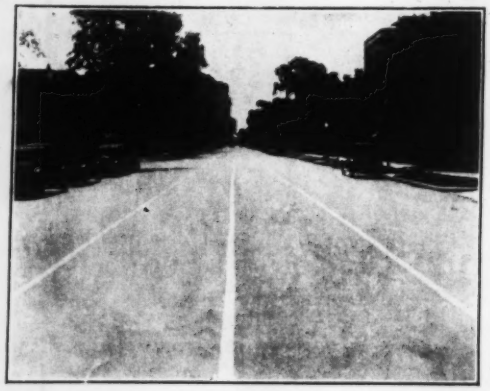
25 of America's *fifty largest cities* have more than 500,000 sq. yds. each

Half-a-million square yards of paving is equivalent to approximately 28 miles of thirty-foot wide street.

Twenty-five of America's fifty foremost cities have paved at least that mileage of streets with TEXACO Asphalt. Some of them have constructed two, three and four times that volume of paving, using TEXACO Asphalt.

At the end of 1930, close to 1,500 cities and towns, distributed throughout the country, had provided themselves with TEXACO-paved streets.

A section of Delaware Street, Indianapolis, Ind., paved with TEXACO Sheet Asphalt.



TEXACO ASPHALT

New York
Philadelphia
Richmond
Boston
Jacksonville

The Texas Company
ASPHALT SALES DEPT.
135 E. 42nd Street, New York City

Chicago
Cleveland
Kansas City
Houston
Dallas
Buffalo